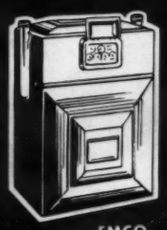
GAS

ENGINEERING • UTILIZATION • LOAD-BUILDING • MANAGEMENT

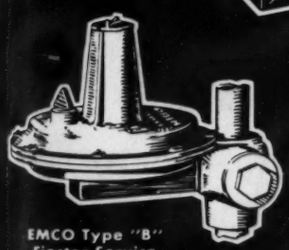
MAY 13 1937
PERIODICAL DIVISION

EMCO means ACCURATE MEASUREMENT AND CONSTANT PRESSURE CONTROL

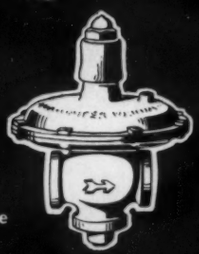
EMCO Standard Domestic Meter



EMCO Tin Meter



EMCO Type "B" Ejector Service Regulator

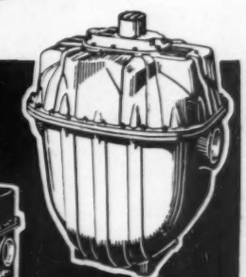


EMCO Gas Appliance Regulator

The late George Westinghouse, founder of the company that is now Pittsburgh Equitable, established a precedent when he proceeded to develop more efficient measuring and regulating devices for Natural Gas. He combined research and sound engineering principles with his masterful inventive ability. That precedent has been followed throughout the progress of the company, which has been coincidental with the growth of Natural Gas, and is the Pittsburgh Equitable Idea.

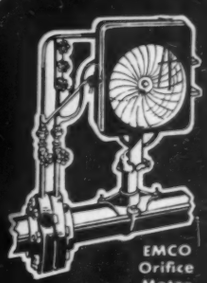
The Pittsburgh Equitable Idea is to bring every aid of modern science into the design and manufacture of gas meters, regulators and allied appliances, so that customers may be provided with the best possible value. To accomplish this end, complete chemical and physical laboratories of our own have been established and are under the direction of competent chemists and research engineers. They are neither hampered by tradition nor cramped facilities. These laboratories also serve as a proving ground to determine the value of all raw materials purchased.

The Pittsburgh Equitable factories are models of their kind. The latest types of machinery—much of it automatic and of special design—assure accurate machining and uniform performance of EMCO products. Workmen are skilled craftsmen, many of whom have spent years with the company. It is the combination of these facilities that has given the name EMCO its high standard and wide, lasting acceptance in Natural Gas.

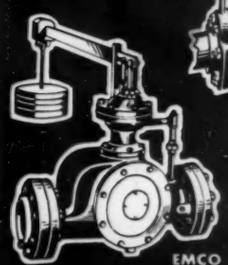


EMCO Large Capacity Meter

EMCO Large Capacity Pressed Steel Meter with Emcorector



EMCO Orifice Meter



EMCO Balanced Valve Regulator

PITTSBURGH EQUITABLE METER CO.

MERCO NORDSTROM VALVE CO.

MAIN OFFICES PITTSBURGH, PA.

LOS ANGELES OAKLAND HOUSTON

KANSAS CITY BUFFALO CHICAGO

NEW YORK ATLANTA TULSA

PHILADELPHIA COLUMBIA MEMPHIS

MAY 1937 • • 25 CENTS

Lithographed on stone by James E. Allen for U. S. Pipe & Foundry Co. Copyright 1937.

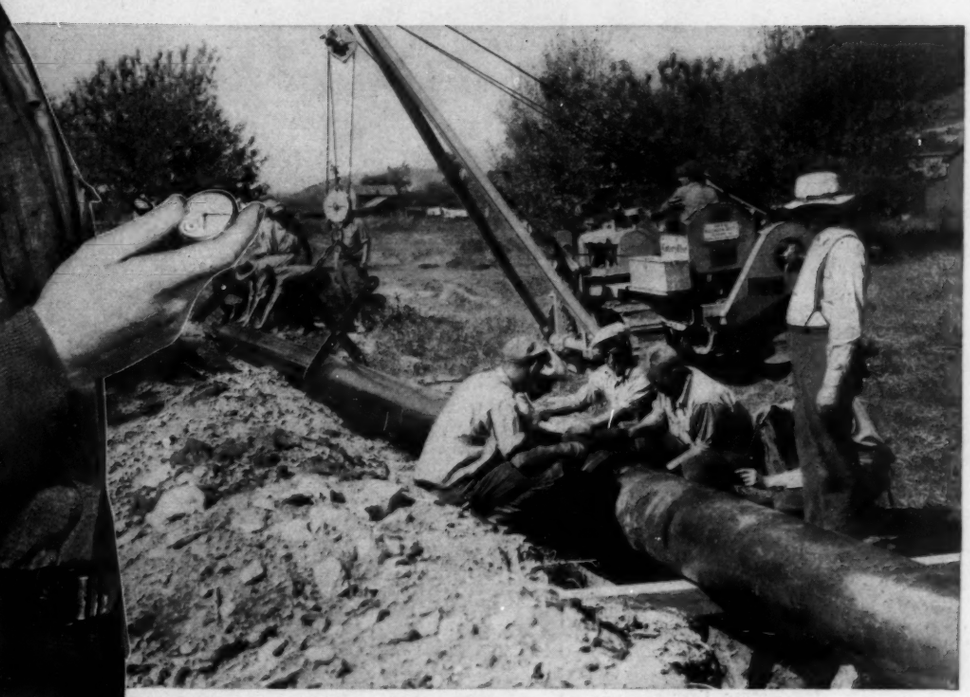
NINE GENERATIONS of engineers have put their trust in cast iron pipe for underground mains requiring structural strength and effective resistance to corrosion. History vindicates their judgment. For cast iron pipe has proved its case beyond question as the most enduring and economical material for the purpose. But cast iron pipe founders are not resting on their laurels. U. S. Super-de Lavaud *Chill-Free* Cast Iron Pipe, bottle-tight mechanical joints, alloy cast iron pipe for super-corrosive conditions—all are developments of recent years.

U.S. cast iron PIPE

Cast iron and alloy cast iron pipe centrifugally or pit cast—for water works, gas, sewerage and drainage service as well as industrial uses involving corrosives.

U. S. PIPE & FOUNDRY CO.
BURLINGTON, NEW JERSEY
Foundries and Sales Offices throughout the U. S.

"NO LOST MOTION ON A DRESSER-COUPLED LINE — EVERYTHING GOES LIKE CLOCKWORK!"



"Straight-line" production best describes the way a Dresser-coupled line is laid. • All field operations are uniform, speedy, and coordinated. The small, well-bunched laying and jointing crew is always "up" with the trencher! There's no lag between operations! Joint-making—mostly a matter of tightening a few bolts—is done the same way every time. All the work moves forward in unison! • In fewer words, the length of line laid with Dresser Couplings is the actual length completed, ready for test!

Note to Reader

This is the third in a series of advertisements dramatizing one engineer's experience with his first Dresser-coupled line. For the complete story, write for Bulletin No. 351.

S. R. DRESSER MFG. COMPANY, BRADFORD, PA.

In Canada: Dresser Mfg. Company, Ltd., 60 Front Street, West, Toronto, Ontario

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GAS

Reg. U. S. Pat. Off.

FORMERLY WESTERN GAS

LOS ANGELES Office: 810 South Spring Street. Phone Michigan 1481
CHICAGO Office: 1064 Peoples Gas Building. Phone Harrison 8536

JAY JENKINS, Publisher GEORGE H. FINLEY, Editor CRAIG ESPY, Mid-Western Manager
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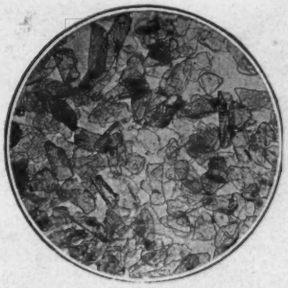
May, 1937. Volume XIII, Number 5. G A S is published monthly by Western Business Papers, Inc. at 810 South Spring Street, Los Angeles, California. Subscription price (in advance), 25 cents the copy. $1.00 per year; other than U. S., $2.00 per year. Entered as second class matter August 20, 1936, at the post office at Los Angeles, Calif., under the Act of March 3, 1879. Copyright, 1937.

MEMBER AUDIT BUREAU OF CIRCULATIONS

OFFICIAL PUBLICATION: Pacific Coast Gas Association; Southern California Meter Association.

MEMBER: Audit Bureau of Circulations; Associated Business Papers, Inc.



Reproduction of the micrograph at the left shows the interlocking of the flakes of the internal reinforcement used by Barrett. By laminating with the waterproofing agent, they give Barrett Pipe Line Enamels unusual toughness and resistance to soil stresses.

For pipe of large diameter, The Barrett Company will furnish equipment required to revolve pipe and spread enamel.

LOW COST . . . per year of service . . . per mile of pipe line covered

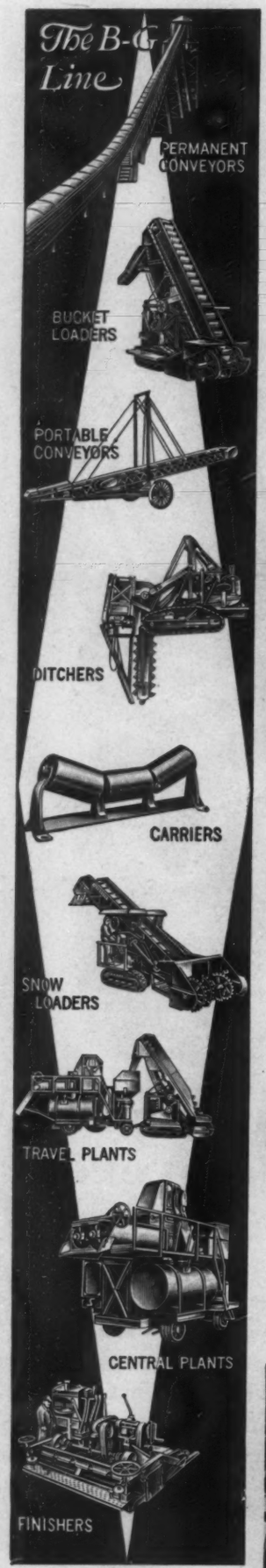
Barrett PIPE LINE ENAMELS

FIELD SERVICE—The Barrett Company maintains a Pipe Line Service Department to assist engineers in all coating problems, and also has available Field Service men whose assistance is offered where Barrett's protective coatings are used. Inquiries are invited.

The unique flake-type filler used in Barrett Pipe Line Enamels permits the use of *smaller* quantities of filler with *larger* quantities of coal-tar pitch waterproofing base. The resultant lower specific gravity of Barrett Enamels means that less material is required per mile of pipe line covered. This important economy is but one of the many reasons why Barrett Enamels are the first choice of engineers who must measure their work in terms of cost per mile per year of service.

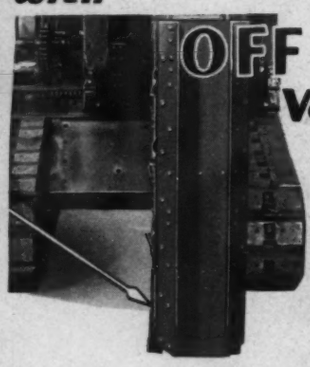
THE BARRETT COMPANY

40 Rector Street **New York, N. Y.**



The Barber-Greene UTILITY Special Ditcher

with OFF-SET Vertical Boom



The B-G Model 54 Utility Special available with booms for cutting 8" to 18" wide, 4' or 5' 6" deep. Ask about the Service Special, only 4' wide overall, for smaller work; the B-G Standard which goes to 8' 3" deep; or the Pipe Line Special for high speed cross country trenching.

The exclusive B-G Vertical Boom gives greater diggability on all B-G Ditchers. There is no ramp to clean out by hand at either end of the ditch. It digs right up to walks, curbs, etc.

With the Barber-Greene Utility Special, the boom is not only vertical, but can be quickly off-set to any point between the crawlers, giving the *optimum in diggability*.

The B-G Utility Special is driven through two transmissions, giving instant traveling or digging speed changes to suit any condition.

Full crawler mounting gives perfect maneuverability (it will turn around on a flat car).

Standardized Material Handling Machines

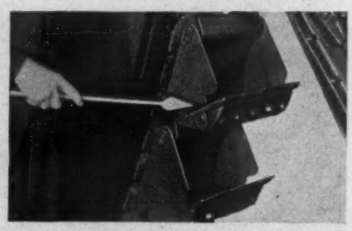
BARBER GREENE

37-9

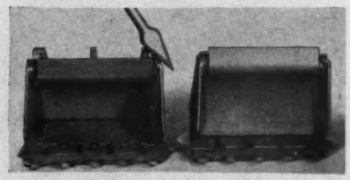
Let us send you complete information on the B-G Utility Special, there is no obligation. Phone, wire or write,

Barber-Greene Company
715 West Park Avenue, Aurora, Illinois

Simply turn this crank to off-set the boom. Can be off-set while digging.

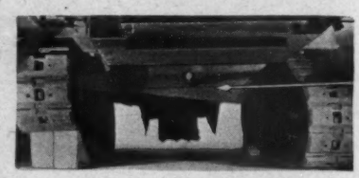


B-G Milling Action digging gives high capacity in easy going, and the ability to cut through the toughest material.

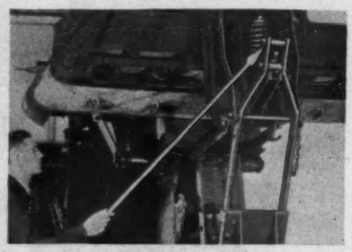


Self-Cleaning Buckets, *Left:* digging position. *Right:* Throw-out position. Manganese nickel alloy steel.

Simple, self-locking power boom hoist.



Oscillating axle. Ditcher remains on even keel over uneven surface.

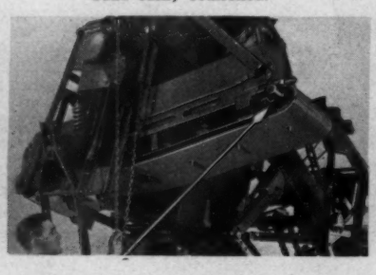


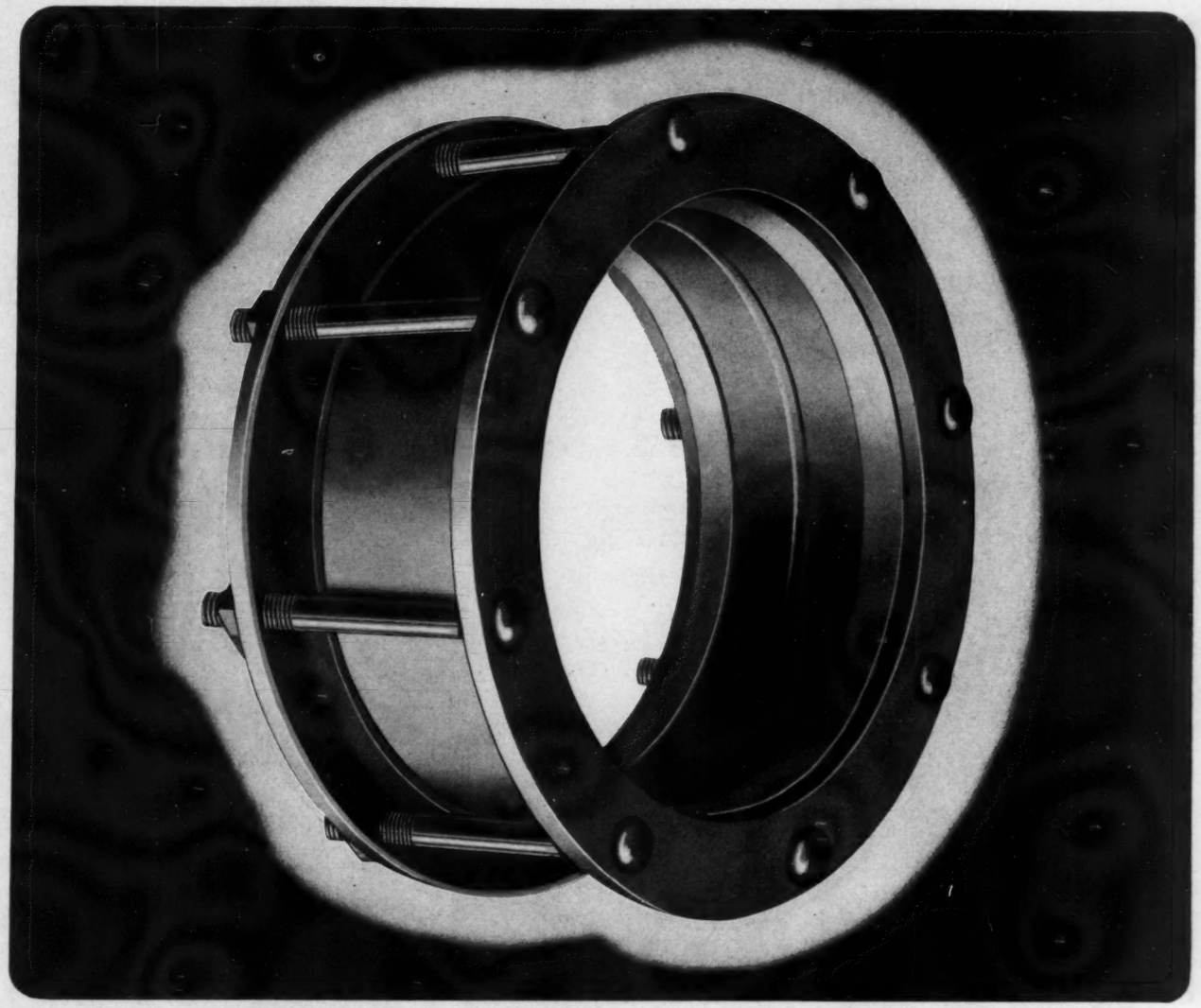
Above: Automatic Self-resetting Overload Release for clean-up scraper.

Below: All controls centered for convenient, more efficient operation.

Automatic Overload Release. Automatically slips when buckets encounter overload. Automatically resets itself.

Conveyor quickly adjusted for discharge on either side. Distance of spoil bank easily controlled.





The Dayton No. 1 Coupling

. . . the modern coupling for the modern pipe line . . . a coupling that eliminates the necessity of special processing of the pipe for installation . . . a coupling so simple in its design and construction that a permanent leak-proof installation can be quickly effected by the most unskilled laborer.

THE NATIONAL SUPPLY CO. OF DELAWARE
DAYTON COUPLING DIVISION · TOLEDO · OHIO

REYNOLDS ☆ for HIGH PRESSURE GAS CONTROL!

☆ One Ton—2,000 Pounds pressure to the square inch of any surface is tremendous force that can either be productive and of service when controlled, or dangerous and destructive when out of control. In the Gas Field the controlling of tremendous pressures is an ever present problem. Reynolds High Pressure Regulators illustrated below have been tested for performance and safety factors for pressures from 2,000 pounds down to 300 pounds. In addition to the three regulators illustrated, Reynolds manufacture a complete line of regulators covering the entire range of pressures. Reynolds specifications can be relied upon for accuracy. Forty-five years of successful experience in the manufacture of Gas Control Regulators is an enviable record.

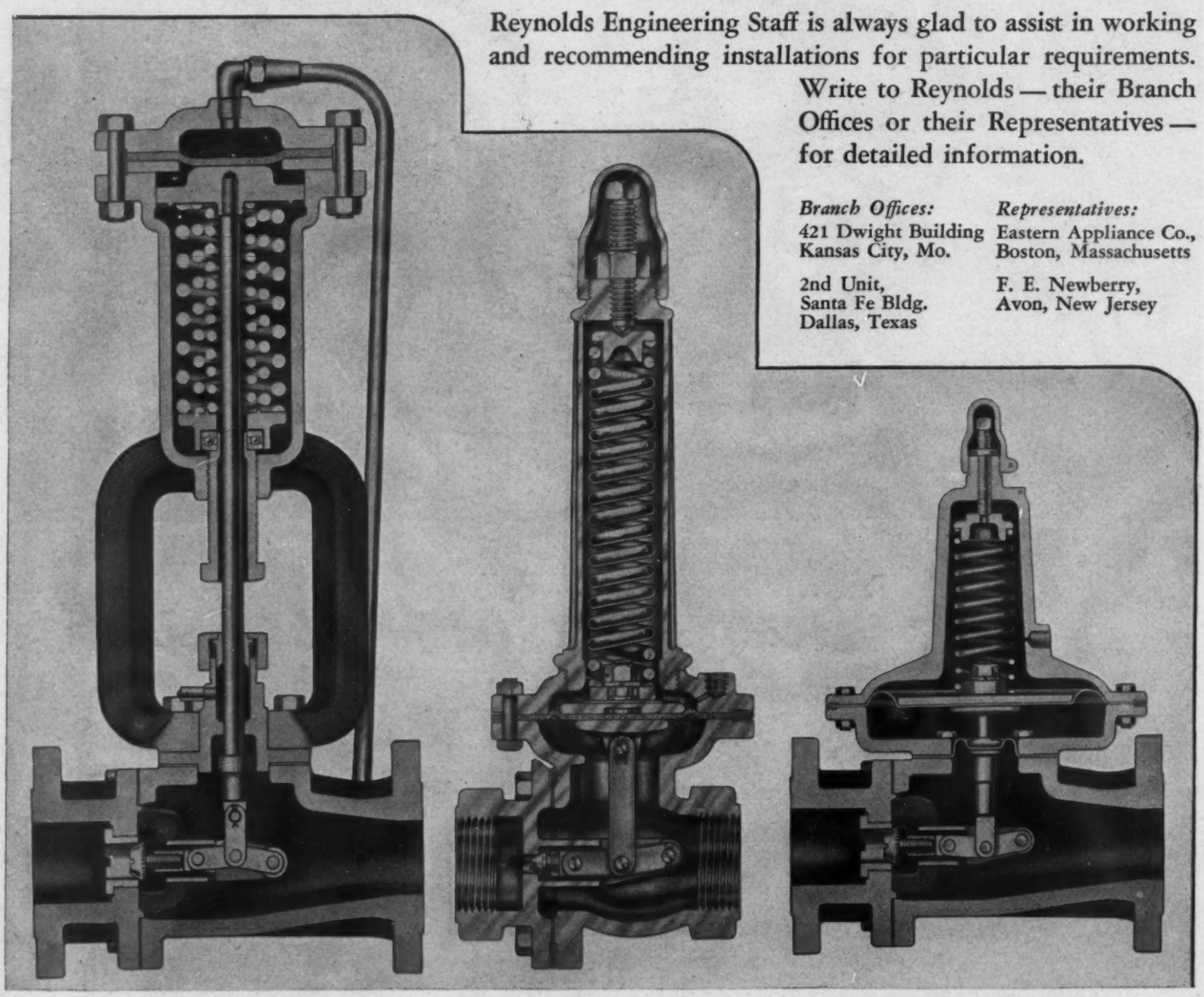
Reynolds Engineering Staff is always glad to assist in working and recommending installations for particular requirements. Write to Reynolds — their Branch Offices or their Representatives — for detailed information.

Branch Offices:
421 Dwight Building
Kansas City, Mo.

2nd Unit,
Santa Fe Bldg.
Dallas, Texas

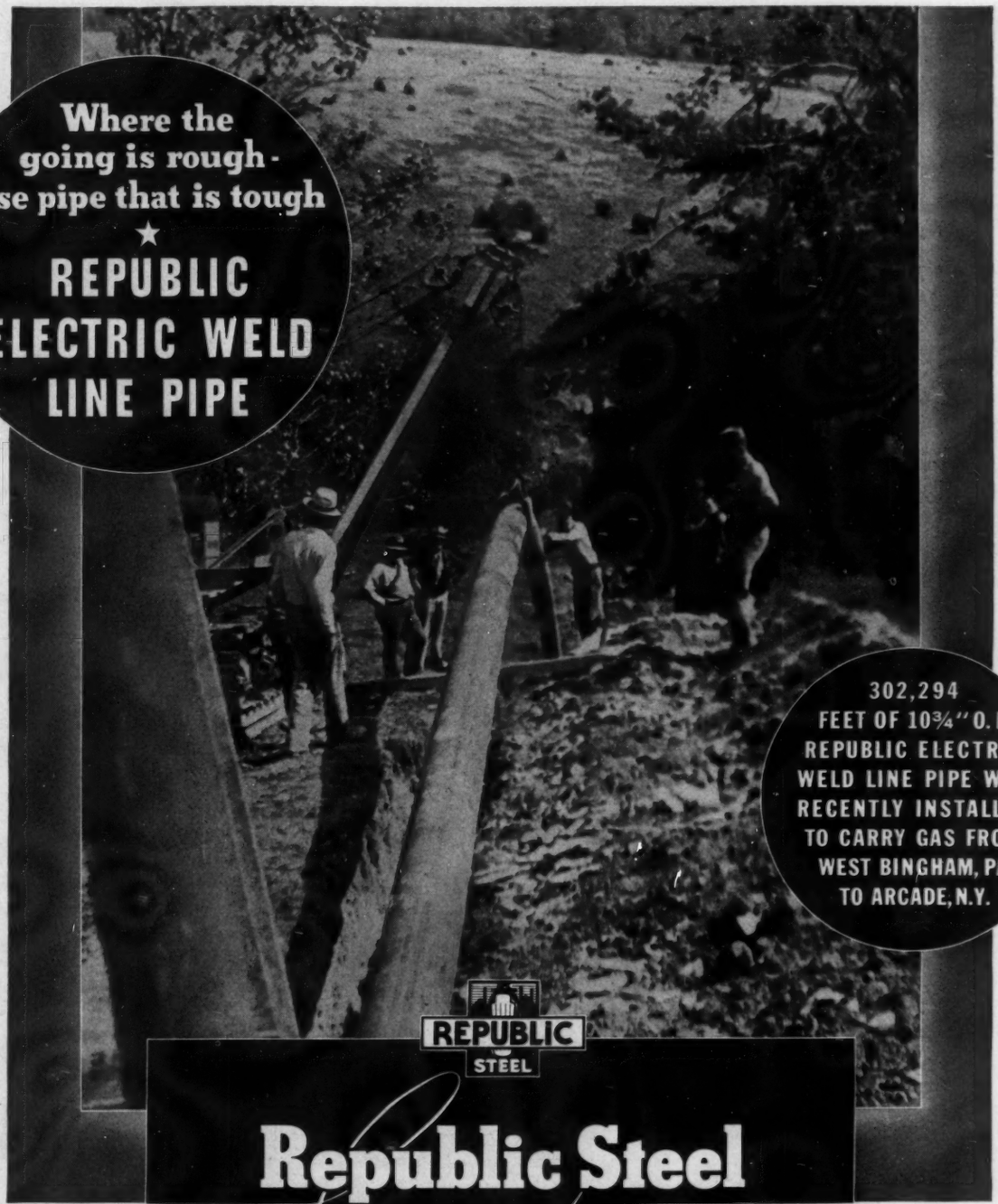
Representatives:
Eastern Appliance Co.,
Boston, Massachusetts

F. E. Newberry,
Avon, New Jersey



- Reynolds One-Ton Regulator is designed for use where the pressure is as high as 2,000 pounds inlet pressure and provides a maximum outlet pressure of 500 pounds.
- Reynolds Screw-Type, One-Half Ton Regulator is designed with ample factors of safety. It handles up to 1,000 pounds reducing same to pounds.
- Reynolds, Flange-Type, One-Half Ton Regulator is a companion Regulator to the tried and tested One-Half Ton Screw-Type, using identical construction features.

REYNOLDS GAS REGULATOR COMPANY
ANDERSON, INDIANA, U.S.A.
RECOGNIZED GAS CONTROL SINCE 1892



Where the going is rough - use pipe that is tough

★

REPUBLIC ELECTRIC WELD LINE PIPE

302,294 FEET OF 10¾" O. D. REPUBLIC ELECTRIC WELD LINE PIPE WAS RECENTLY INSTALLED TO CARRY GAS FROM WEST BINGHAM, PA. TO ARCADE, N.Y.

REPUBLIC STEEL

Republic Steel Corporation

GENERAL OFFICES . . . CLEVELAND, OHIO

PERFECTLY ROUND

UNIFORM WALL THICKNESS

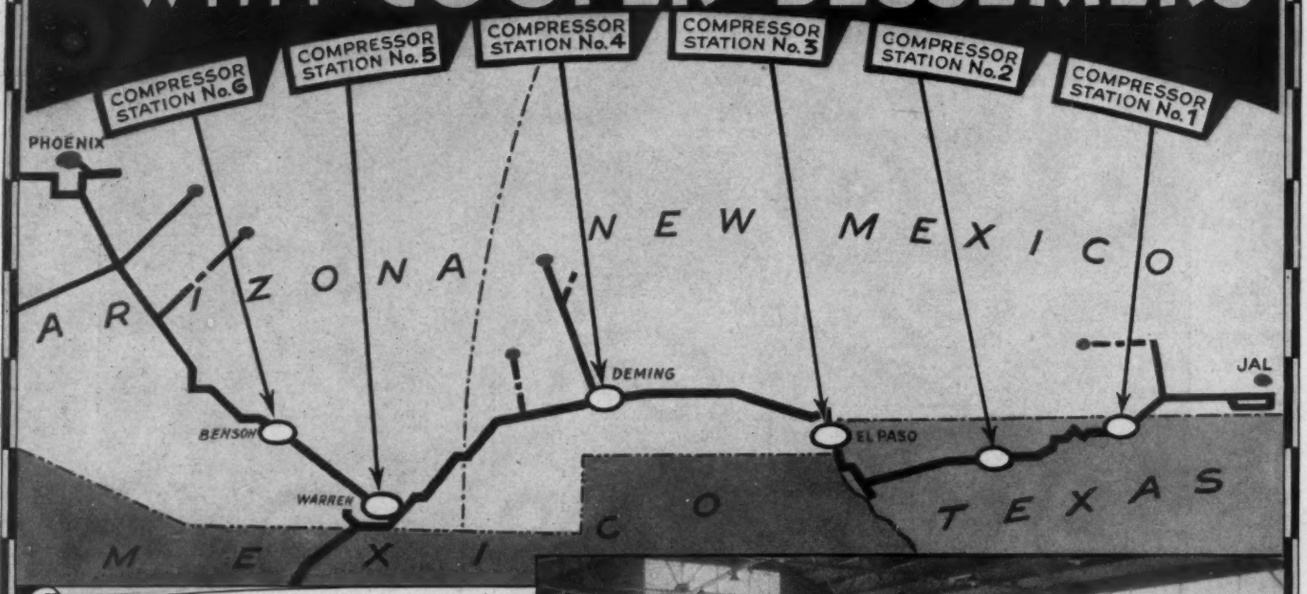
FREE FROM SCALE

HIGH YIELD POINT WITH HIGH DUCTILITY

EASY TO WELD

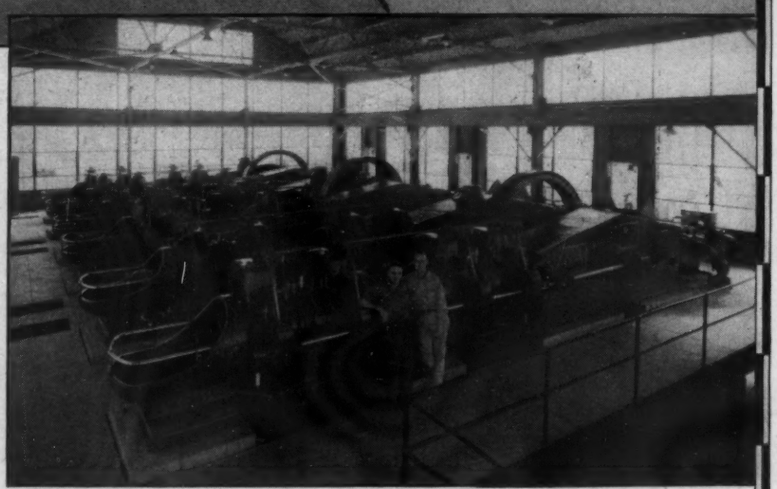
LONG LENGTHS

Another NETWORK SPREADS ACROSS THE MAP ---WITH COOPER-BESSEMERS



Map above shows pipe lines in operation -- EL PASO NATURAL GAS CO. and Subsidiaries.

Twin - tandem compressor units -- like those shown at the right -- power the six compressor stations, indicated.



« « El Paso Natural Gas Company's network -- with its start in the Jal, New Mexico, field -- crosses three states and extends into Mexico. The system is constantly extending and branching, and Cooper - Bessemer compressor units are being used exclusively.

« « And so, "El Paso" is another prominent utility that puts its whole faith in slow-speed, heavy - duty units -- Cooper - Bessemers !

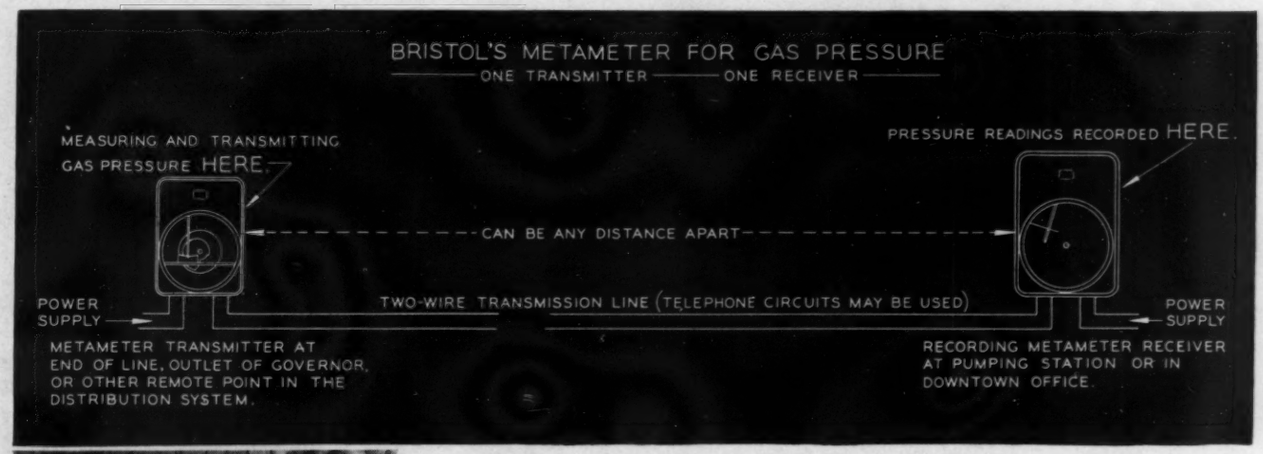
THE COOPER - BESSEMER CORPORATION

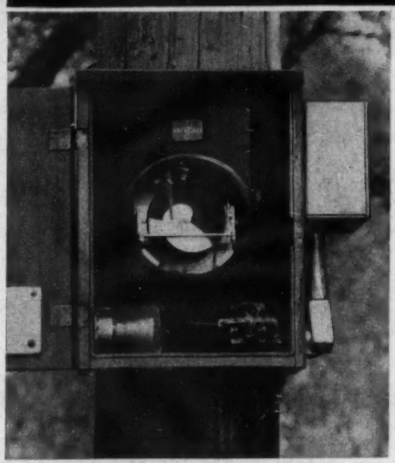
640 EAST 61st STREET . . . LOS ANGELES, CALIFORNIA

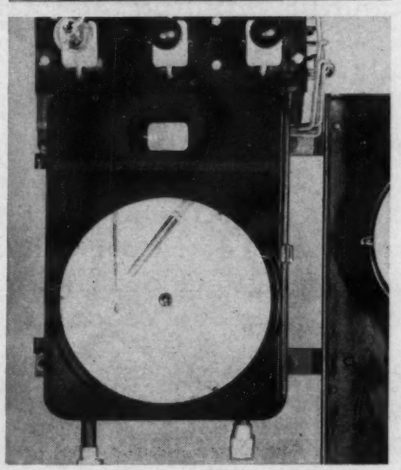
25 West 43rd St., New York City Mills Bldg., Washington, D. C. 631 Spring St., Shreveport, La. 201 East 1st St., Tulsa, Oklahoma Magnolia Bldg., Dallas, Texas Esperson Bldg., Houston, Texas

Mount Vernon, Ohio — PLANTS — Grove City, Pennsylvania

HARNESSING PRESSURES 8 MILES AWAY *lowers pumping costs*


BRISTOL'S METAMETER FOR GAS PRESSURE
ONE TRANSMITTER — ONE RECEIVER
MEASURING AND TRANSMITTING GAS PRESSURE HERE.
PRESSURE READINGS RECORDED HERE.
CAN BE ANY DISTANCE APART
POWER SUPPLY
TWO-WIRE TRANSMISSION LINE (TELEPHONE CIRCUITS MAY BE USED)
POWER SUPPLY
METAMETER TRANSMITTER AT END OF LINE, OUTLET OF GOVERNOR, OR OTHER REMOTE POINT IN THE DISTRIBUTION SYSTEM.
RECORDING METAMETER RECEIVER AT PUMPING STATION OR IN DOWNTOWN OFFICE.





Another Metameter installation offering you a money-saving suggestion

For checking line pressure and holding it within proper limits, one company has installed the Transmitter of a Bristol's Metameter on a street pole, as shown, at a suitable point in the line. The Recording Receiver is located in the pumping station, eight miles away.

As a result there is no guessing about what's going on. Or about when to operate the pumps. The 12 inch Metameter chart instantly reveals every pressure fluctuation at the distant point. It shows whether this is large or small, abrupt or gradual. It provides an invaluable guide to the station attendant in keeping pumping to a minimum, consistent with satisfactory service.

The resulting savings are so surprising that the chances are you, too, will want further information. Write for Bulletin No. 424-N.

THE BRISTOL COMPANY
WATERBURY CONNECTICUT
Branch Offices: Akron, Birmingham, Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Seattle. Canada: The Bristol Company of Canada, Limited, Toronto, Ontario. England: Bristol's Instrument Company, Limited, London, N.W. 10

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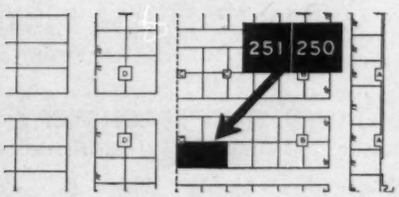
TRADE MARK REG. U.S. PAT. OFF.



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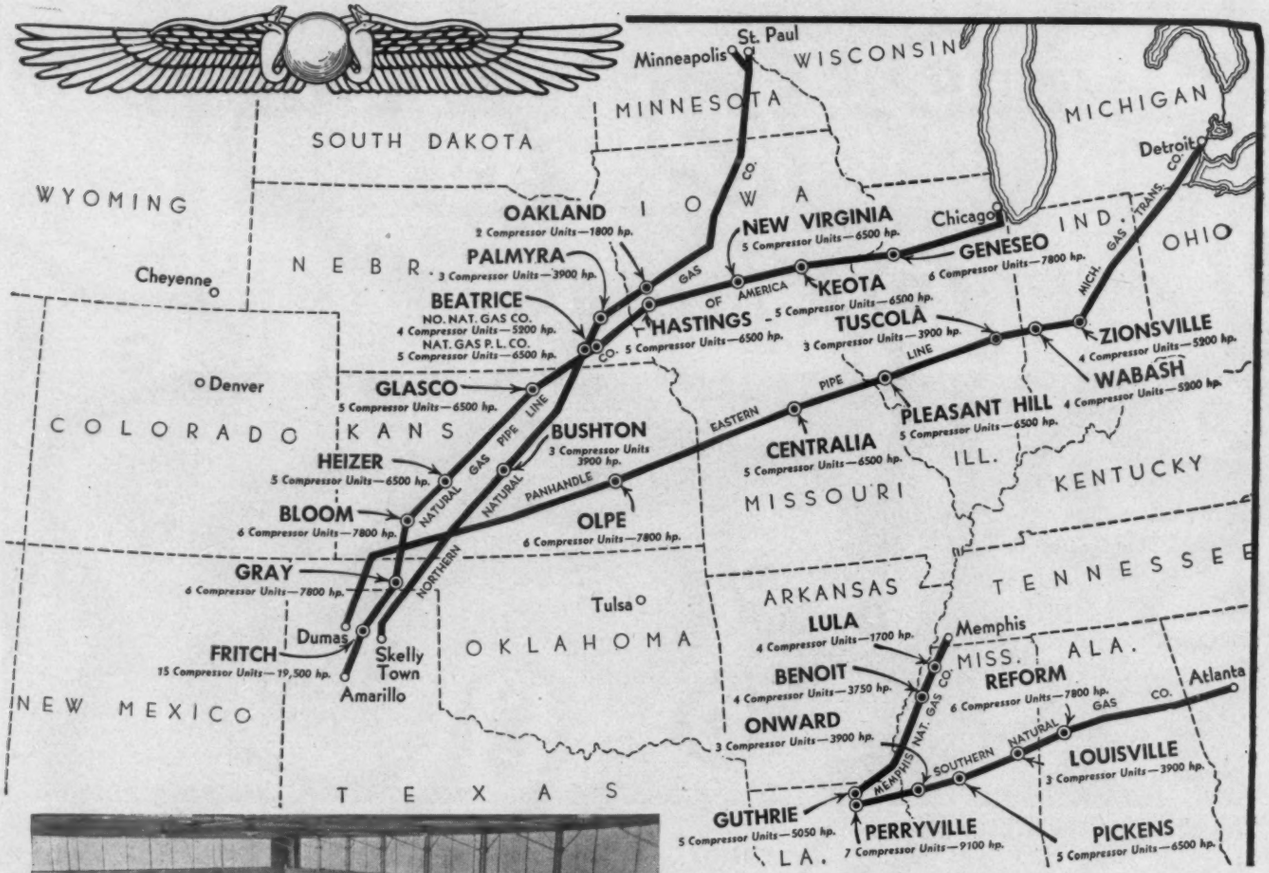

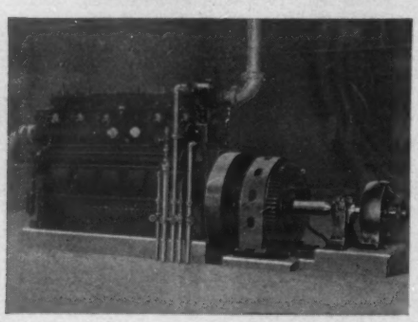

Above: Four Worthington 1300-hp. 24" x 36" Twin Tandem Gas Engine Gas Compressors

Left: Worthington 180-hp. Vertical Gas Engine . . . as installed for station service on the several lines

26 MORE

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31,420 ADDITIONAL HORSEPOWER
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plied in the next few days.

MAKE TIGHT SHUTDOWNS

CHICAGO, ILL., Feb. 19—When the frost leaves the ground, many sections of gas lines must be shut down for repairs needed after winter's damage. One problem that always confronts repair crews is the possibility of gas leakage through the line valves which must be shut down before repairs can be made to the line.

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When you install Crane valves you are taking out the best possible insurance against leaks through valves when shutdowns must be made. The extreme care used to manufacture Crane valves to close fit, the rigorous inspection and testing of each valve, insure you valves that are tight and that stay tight. In the extensive Crane line you can find valves of metals and combinations of metals that will resist the various corrosive conditions you may encounter.

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is only as modern as the gas range ★

The standard of broiling performance depends entirely on the devices contained in the range.

The Universal, with its advanced devices—(1) In-A-Drawer Broiler; (2) Savory Broiler Grid; (3) Equalator Precision Burner; (4) Door Governor—makes possible a new and higher standard of broiling performance.

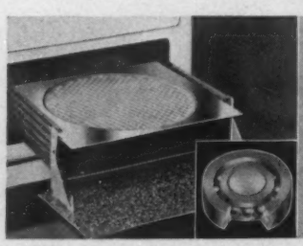
➢ ➢ *Universal Gas Ranges* With Their Scientifically Engineered Broiling Compartment Bring a New Advance to the Art and Method of Broiling

• • • Broiling is a division of cookery in which gas as a fuel presents unquestioned advantages to the consumer—provided, however, that the range is equipped with broiling devices which permit the highest standard of broiling performance.

The Universal Gas Range emphasizes the superiority of gas for all broiling purposes. It guarantees successful results, regardless of the nature or size of the food to be broiled. And, an important consideration is that it accomplishes the job of broiling without smoke, with no danger of burning the hands or face. Broiling with a modern Universal Gas Range is easy, effortless and safe.

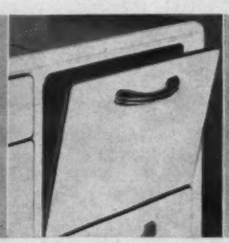
Not only in broiling, but in all divisions of cookery, the Universal gives a standard of performance that creates an entirely new conception of modern gas cooking service.

From every standpoint, Universal Gas Ranges, are designed and built to meet the needs and demands of the gas utility company that is primarily interested in furnishing its customers appliances that promote the highest standard of gas cooking performance.

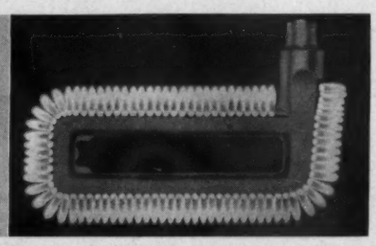


In-A-Drawer Broiler—pulls out like a drawer—operates on roller ball bearings. Smooth in operation.

Savory Cast Aluminum Broiler Grid with chromium pan.



Oven Door Governor—keeps door in set open position during broiling.



Equalator Precision Burner—gives speed plus even distribution of broiling heat. Door governor assures proper flame height.

Universal Gas Ranges

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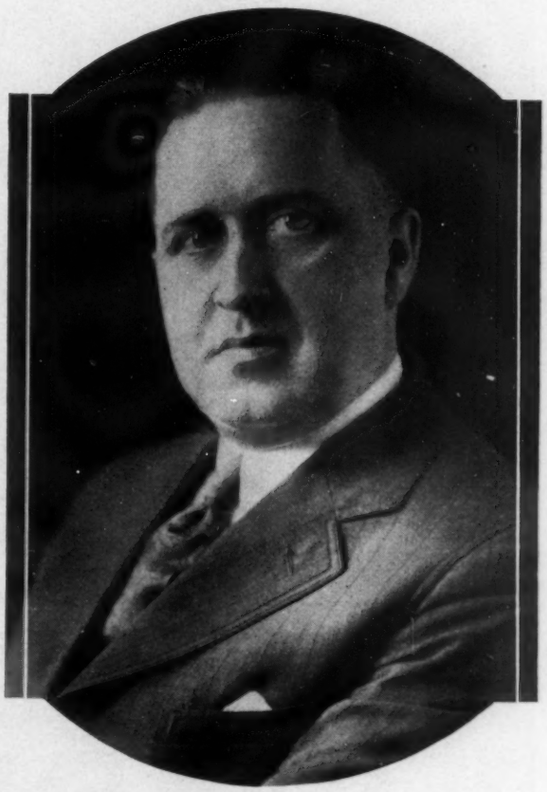
GAS
May, 1937

Guest Editorial



OPPORTUNITY IS KNOCKING

By GEORGE E. WELKER

Chairman, Natural Gas Department
American Gas Association

OPPORTUNITY is Knocking. Are we taking full advantage of it? The Gas Industry has awakened and "gone modern" and we have passed up the "Doldrums" for action.

During the past year we have seen real progress made in nearly every phase of our industry; investment fear has been supplanted by a new-born courage; we have by the media of more promotional rate forms and better salesmanship appreciably bettered our load factors and increased our sendouts; with the help and co-operation of our Manufacturers' Association, A.G.A.E.M. and its members, we have made rapid strides in the development of domestic and industrial gas burning equipment, which is not only highly efficient but also modern in design and appearance, and we no longer need hesitate to enter into any competitive market; and last but not least we have started to "tell the world about it." The leaders of our industry are no longer content to sit back and await business, they are "going after it"; and one need only to pick up his favorite magazine to visualize and learn that the gas industry is alive and active. Our national advertising program has already cut its eye teeth and emerged a full fledged gas salesman. We can even go to the movies and see our gas appliances displayed. All along the line we see evidenced a new and awakened interest in the destiny of our business.

But ——; what are we going to do about it? *Now.* Are we going to be content to just coast along, or have we at last acquired the will to forge ahead regardless of times or difficulties? Much of our lost prestige has been of our own making and due largely to an "ostrich attitude" of paying little or no attention to such important phases of our business as sales promotion, sales planning, manufacturer co-operation, sound merchandising principles *and proper advertising.* A great deal of the recent improvement in our Industry can be traced directly to increased executive interest, so let's continue with such practice and every one from the President to the Office Boy "take on" his share of the job and show our respective communities what co-operation and well-guided initiative can produce in the way of better gas service.

Also, let us tackle our Research program with a renewed interest now that we can see just ahead of us the wonderful opportunity for new business in the field of air conditioning. Gas has many natural advantages to help it surpass all competition in this new field, but we should also be awake to the further possibilities awaiting development by proper and diligent research pursued both locally and nationally. We should concentrate on research development of other such features of our business as possess unusual possibilities, such as gas engine driven power and floodlighting; further and more exact control of gas heating applications, further improvement and development of convection heating methods, radiant tube types of furnaces, diffusion combustion equipment, gas carburizing and controlled protective atmospheres in connection with bright annealing in the metal industries, etc.

From the foregoing it is evident that we have made a good start, and have awakened to some of the needs of our industry; also that many further developments are still lying dormant awaiting our call. We are all eager to move forward and the measure of our success will be limited only by our determination to carry on regardless of difficulties and make the most of our opportunities.

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GAS

Vol. XIII, No. 5

THIRTEENTH YEAR OF PUBLICATION

LOS ANGELES—810 South Spring Street. . 1064 Peoples Gas Building—CHICAGO

RENEWED PIPE LINE ACTIVITY SEEN IN 1936-37 ADVANCES

By ARTHUR ROHMAN

Managing Editor, GAS

WITH this annual Natural Gas issue, the publishers of GAS again present a survey detailing the construction of natural gas pipe lines, both that completed and that now in progress, which has been launched during the past twelve-months period. In compiling this survey questionnaires were sent to the nation's major gas utilities, and the results, which are made possible through the cooperation of 65 of the country's gas transmission and distribution operators, are offered in the tables accompanying this running account.

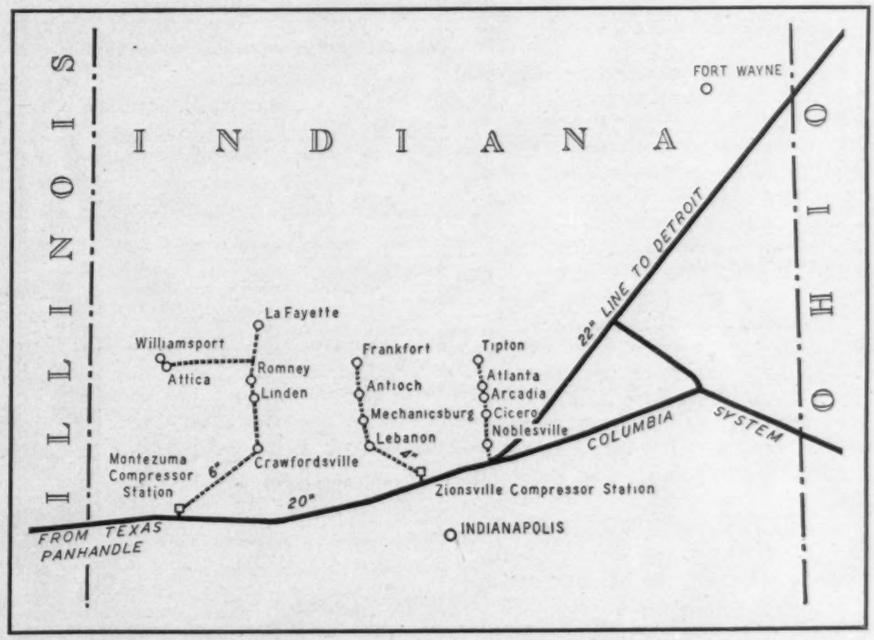
As this issue goes to press, word has been received of two important expansion projects planned for the near future which deserve special mention. The Panhandle Eastern Pipe Line Co. has announced extensive additions to its pipe line system and compressor station capacities, with construction operations to begin this month. The Public Service Co. of Indiana has contracted to purchase gas from the Michigan Gas Transmission Corp. and will bring natural gas service to a group of 16 Indiana towns. First change-over operations began early this month, and August 1 has been set as the date of completion for the entire project. (See map, right).

In connection with the tables herewith published, it must not be assumed that these are entirely complete, as information was not everywhere available. Yet, the tables do present the major developments of the past year. All in all, as the result of activities throughout the country during the past twelve months, a grand total of 2622.33 miles of pipe line was completed and over 100 miles is now under construction. Compressor stations at some 40 points have either been newly constructed or their capacities have been increased. A total of 69 cities and towns have been added to the natural gas roster.

To supplement the information contained in the tables, a brief resume of expansion activities in the industry during the past year is presented.

Progress in the East

Major project of last year—the accomplishment of which has since become history—was the pipe line and



The group of Indiana towns shown on the map, will be changed over to natural gas service within the next few months. The territory is served by Public Service Company of Indiana, using gas from the Michigan Gas Transmission main line to Detroit. The dotted lines indicate generally the routes of lateral tie-in construction.

GAS TRANSMISSION LINE AND COMPRESSOR STATION CONSTRUCTION—1936-1937

As Reported by Principal Companies

TRANSMISSION LINES (Five Miles or More in Length)				COMPRESSOR STATIONS	
Company	Location of Line	Length (Miles)	Size (Inches)	Location	Total Capacity
Arkansas Louisiana Gas Co., Shreveport, La.	From point of connection with Richland-Monroe-Shreveport 20" main line—6 miles north of Simsboro, La.—to Driscoll Gas Field, Driscoll, La.	10.58 6.33 16.91	14 12		
	From point of connection with Pittsburgh, Texas to Mt. Pleasant, Texas 6" line—2½ miles south of Mt. Pleasant, Texas—to Talco, Titus County, Texas.	3.42 15.55 1.56 4.29 1.50 26.32	10 8 6⅝ 6 4		
Cabot Gas Corp., Olean, N. Y.	From State Line Field in Potter County, Pa. to Rochester, N. Y.	94	14		
	From State Line Field in Potter County to Sabinsville Field in Tioga County, Pa.	24	12		
Central States Power & Light Corp., Tulsa, Okla.	Pampa, Texas	7	6	Quinton, Okla. (1)**	1230 B. hp.
Cities Service Gas Co., Bartlesville, Okla.	Lincoln County, Okla.	6	8	Hutchinson Sta., Reno County, Kan. (1)	170 hp.
	Oklahoma County, Okla.	8¾	8		
	Harvey County, Kan.	5½	4	Wellington Sta., Sumner County, Kan. (2)	85 hp.
	Greenwood County, Kan.*	7½	6		
	Oklahoma County, Okla.*	47	12		
Consolidated Gas Utilities Corp., Oklahoma City, Okla.	Chickasha Field to Cement Field. Sayre Field to Erick Field.†	10 9.75	10 8		
Consumers Power Co., Jackson, Mich.	From Millbrook Twp., Mecosta County to Lansing, Mich.	62.3	10¾ O. D.	Sec. 10, Broomfield Twp., Isabella County, Mich. (1)	250 B. hp.
	From Crystal Twp., Montcalm County to Alma Gas Plant.	16.4	4½ O. D.		
Dickey Oil Co., Wichita, Kan.	From Graber Pool, east of McPherson, Kan. to Kansas Power and Light Co., northwest of Moundridge.	8½	4		
El Paso Natural Gas Co., El Paso, Texas	From near Gage, N. M. to Silver City, N. M.	42.7 2.0 44.7	5 O. D. 4½ O.D.	Near Douglas, Ariz. (1)	1520 hp.
	From near Casa Grande to Ajo, Ariz.	82.6	8⅝	Near Benson, Ariz. (1)*	1520 hp.
	From near Jackson Butte to Chandler, Ariz.	5.93	2⅜	Texas & New Mexico (four stations) ††	9120 hp.
	From Main Line from El Paso to Lordsburg, N. M.†	24	4		
Equitable Gas Co. (Pittsburgh & W. Va. Gas Co.) Pittsburgh, Pa.	From a point west of Grafton to Lumberport, W. Va.	12	12	Near Grafton (1)	320 hp.
Grand Rapids Gas Light Co., Grand Rapids, Mich.	From Six Lakes Field to Grand Rapids, Mich.	45	10¾ O. D.		
Hope Natural Gas Co., Pittsburgh, Pa.	From Clendening to Hastings, W. Va.	95	12¾		
Houston Pipe Line Co., Houston, Texas	From Main Line at Dickinson to League City, Texas.	5			
	From Houston City Limits to Ferris Brick Co.	4.18	6		
	From Galena Park, Texas to Clinton, Texas.	4.67	6		
	From La Marque, Texas to Dickinson, Texas.	6.00	6		
Humble Oil & Refining Co., Houston, Texas	From Tomball Field in Harris County, Texas, to serve industrial areas at Houston, Port Arthur, Baytown, Beaumont, and Port Neches.	122	10		
Industrial Fuel Supply Co., Los Angeles, Calif.	Ten Sections Field, Kern County, to Buena Vista Lake Field, connecting with So. Calif. Gas Co.'s main line to Los Angeles, Calif.	7.51	16		
Kansas Pipe Line & Gas Co., Salina, Kansas	From Ogallala to Holdredge, Neb.	150		Elm Creek (3)	125 hp.
	From Holdredge, Neb. to Rush County, Kan.	140			
	From Alma to Red Cloud, Neb.	45	6-4-2	Stockton, Neb. (3)	125 hp.
	Lateral to Arapahoe and Holbrook.	40	4		
	Lateral to Norton and Almena.	35	4		
Kansas Power & Light Co., Salina, Kan.	From Wamego 8-inch line to Westmoreland Junction.	11.48	4		
	From Westmoreland Junction to Westmoreland.	5.56	3		
	From Westmoreland Junction to Onaga.	5.70	3		
Kentucky Natural Gas Corp., Owensboro, Kentucky	From Montezuma to Terre Haute, Ind.	24	12		

*In progress. †Proposed Construction. ‡Added to existing stations. **Figures in parentheses indicate the number of compressors in a station.

(Continued on Page 18)

compressor station construction and the change-over program carried on in connection with the bringing of natural gas to the nation's fourth largest population center, Detroit. The various phases of this undertaking have been related in detail in the September (Detroit Souvenir) issue of GAS. A discussion on the final accomplishment of the project was contributed to the January, 1937 issue by Mr. F. P. Fisher, consulting engineer, of Detroit.

In further connection with the Detroit project, it is noted that continuous expansion activities have been and are being carried on. During the past year the Michigan cities of Grand Rapids, Grandville, Rockford, and Sparta, all served by the Grand Rapids Gas Light Co., have been added to the roll of natural gas communities. These cities, together with Alma and Lansing which are now using natural gas served by Consumers Power Co., offer a combined total population of over 250,000 potential gas consumers. And this is merely a bonus added to the Detroit population of 1,568,662. The expansion activities of the Grand Rapids and Consumers Power Companies necessitated the building of 123.7 miles of transmission line during the past year.

To augment service to the Detroit area, The Panhandle Eastern Pipe Line Co. has projected the huge expansion program on its distribution system stretching from the Panhandle fields in Texas to the Michigan area, as mentioned above. The existing line will be looped, a total of 227 miles of 24-inch pipe will be laid on the discharge side of the stations at Liberal, Greensburg, Haven, Olpe, and Louisburg, Kan.; and Houstonia, Mo. A total of 24 miles of 22-inch line will be laid outside of the stations at Centralia, Mo. and Pleasant Hill, Ill. Four river crossings will be made, and absorption and dehydrating equipment will be added to the natural gasoline plant at the Liberal station. New gas wells will be drilled in the Hugoton field in Kansas and extensions made to the gathering system.

National Tube Co. and A. O. Smith Corp. will furnish the pipe, with delivery scheduled for this month.

A new compressor station with three 1300-hp. engines will be constructed at Tuscola, Ill. Additions to existing compressor stations will include: three 1000-hp. engines at Liberal; three 1300-hp. engines at Greensburg; three 1300-hp. engines at Haven; three 1300-hp. engines at Olpe; two 1000-hp. engines at Louisburg; one 1300-hp. engine at Houstonia; two 1300-hp. engines at Centralia; three 1300-hp. engines at Pleasant Hill; and one 1000-hp. engine at Glenarm.

Further progress in the north and eastern sector of the country is reported by the Dominion Natural Gas Co., Buffalo, N. Y., with the addition of the Canadian town of St. Thomas; population, 16,026. Still other Canadian expansion reported by the Union Gas Co. of Canada, Ontario, includes the addition of three towns totalling an approximate population of 800, adding 17,000 potential consumers in the Canadian area.

A notable construction event of the past year was the completion in January, 1937 of 105 miles of 12-inch pipe line by the Peoples Natural Gas Co., Pittsburgh, Pa. (*GAS*, Dec., 1936, p. 34.) The line was put down in rough, hilly country from Hebron Township, Potter County, to the company's Pew compressor station near Limestone, Clarion County, carrying gas from the Hebron field into the Pittsburgh area at the rate of approximately 25,000,000 cu. ft. per 24 hours.

Another noteworthy eastern development completed last year by the Penn York Natural Gas Co., Buffalo, N. Y. was the 57.2 mile of 10-inch line from the Harrison field in Pennsylvania to Arcade, N. Y. At Arcade the line was divided into 42 miles of 8-inch carrier to Sheridan, N. Y., and into 31 miles of 8-inch pipe to Clarence, N. Y. (*GAS*, Aug., 1936, p. 94). As a result of this construction seven other New York towns received natural gas service.

The Mid-West Territory

Shifting attention from the East to the Mid-west area, it is fitting to remark first upon the Indiana change-over project mentioned above. Sixteen cities and towns served from the mains of the Public Service Co. of Indiana, Indianapolis, Ind. will receive natural gas this summer. The first change-over was made in Noblesville at midnight, May 3.

The Public Service Commission of Indiana has approved a contract between the company and the Michigan Gas Transmission Corp. for the purchase of natural gas from the latter company's pipe line which crosses Indiana in a northeasterly direction to Detroit. The commission also has approved the Public Service Company's rate schedules, which will be the same in each of the communities served.

The following schedule has been established for the change-over: Noblesville, May 3; Arcadia, Atlanta, Cicero and Tipton, by May 10; Lebanon and Ulen, May 17; Antioch, Mechanics-

CITIES AND TOWNS INTRODUCING NATURAL GAS SERVICE 1936-1937

Listed below by states under the name of the serving gas company are the cities and towns which during the past year introduced natural gas service. The figures following each city listed represent its population. Additional data in some cases is offered in parentheses.

ARIZONA

El Paso Natural Gas Co., El Paso, Texas: Ajo, 4,571; Casa Grande, 1,351; Chandler, 1,378.

CALIFORNIA

San Diego Consolidated Gas & Electric Co., San Diego, Calif.: Escondido, 3,421 (500 meters).

ILLINOIS

Natural Gas Pipeline Co. of America, Chicago, Ill.: East Moline, 10,107; Moline, 32,326 (11,300 meters) (Converted from manufactured to natural gas); Rock Island, 37,953 (9,700 meters).

INDIANA

Natural Gas Pipeline Co. of America, Chicago, Ill.: Silvis, 2,650.

Public Service Co. of Indiana, Indianapolis, Ind.: Antioch; Arcadia, 912: Atlanta, 551; Attica, 3,700; Cicero, 933; Crawfordsville, 10,355; Frankfort, 12,196; Lafayette, 26,240; Lebanon, 6,445: Linden, 541; Mechanicsburg, 119; Noblesville, 4,811; Romney, 216; Tipton, 4.861; Ulen, 74; Williamsport, 1,053; New Castle, 14,027. (Change-over operations now under way.)

KANSAS

Cities Service Gas Co., Bartlesville, Okla.; Burr Oak, 595; Frederick, 135.

Stryker Gas Co., Fredonia, Kan.: Severy, 525.

Kansas Pipe Line & Gas Co., Salina, Kan.: Glade, 218; Logan, 743; Norton, 2,767; Painville; Phillipsburg, 1,543; Speed, 139; Stockton.

Tri-county Gas Co., Holcomb, Kan.: Deerfield, 325; Friend, 23; Holcomb, 64; Lakin, 739; Scott City, 1,544; Tennis.

LOUISIANA

United Gas Public Service Co., Houston, Texas: Myrtis, 75 (60,000 M c.f.).

MICHIGAN

Consumers Power Co., Jackson, Mich.: Alma, 6,734 (1,724 meters) (Converted from manufactured to

(Turn to Page 19) (Column 2)

GAS TRANSMISSION LINE AND COMPRESSOR STATION CONSTRUCTION—1936-1937

(Continued from Page 16)

TRANSMISSION LINES (Five Miles or More in Length)

Company	Location of Line	Length (Miles)	Size (Inches)
The LeFlore County Gas & Electric Co., Poteau, Okla.	From Red Oak Gas Field in Latimer County, Okla. to point on old line at Compressor Station.	26	8
Lone Star Gas Co., Dallas, Texas	From Irving to Cayuga and Long Lake Fields, Texas.	108	20
Memphis Natural Gas Co., Memphis, Tenn.			
Michigan Gas Transmission Corp.	From Zionsville, Ind. to Mellvindale, Mich. (Detroit City Gas Co.'s System)	230	22
	From Main Line to Crawfordsville, Ind.*	21	6
	From Main Line to Lebanon*	14	4
	From Mich. Gas Transmission Corp.'s 22-inch line near Carlton, Mich. to lines of the Washtenaw Gas Company at Ann Harbor, Mich.	21	6
Missouri Power & Light Co., Jefferson City, Mo.	From Raytown, Mo. to Missouri River.	10	8
	From Missouri River to Liberty, Mo.[1]	6	6
Montana-Dakota Utilities Co., Minneapolis, Minn.			
J. W. Moore & Son, Goldthwaite, Texas	From Brownwood Gas Field to Goldthwaite, Texas.	30	3
Mountain Fuel Supply Co., Salt Lake City, Utah	From Clay Basin Field to tie in with 16-inch line from Hiawatha Field to Green River, Wyo.†	20	10
Mountain States Power Company, Casper, Wyoming	To Golden Eagle Dome, Wyo.	12	4½
	Thermopolis, Wyo.	24	6
Natural Gas Pipeline Co. of America, Chicago, Ill.			
New York State Nat. Gas Corp., Pittsburgh, Pa.	From Main Line to Harrison Pool	9.4	10
Northern Natural Gas Co., Omaha, Neb.	From Hugoton, Kan. to Mullinville, Kan.	107	20
	From Clifton to Washington, Kan.*	20	20
Northwestern Utilities, Ltd., Edmonton, Alta., Can.	Two miles west of Ryley to four miles east of Tofield.	5.3	12¾
	From Edmonton to original line at 5-Mile Valve†	5.3	12¾
Ohio Fuel Gas Co., Columbus, Ohio	From Lick Compressor Station, Jackson Co., to Harper Gate Station, Winton County.	24.5	12
Oklahoma Natural Gas Co., Tulsa, Okla.	From near Claremore and Collinsville to field near Oolaga, Okla.	1¾ 6½ 8¼	4 2
	From Norge Compressor Station near Ninnekah and Chickasha to Cement Field near Cement, Okla.	7⅛	8⅝ O. D.
Panhandle Eastern Pipe Line Co., Kansas City, Mo.	From near Liberal, Kan., N. E., 40 miles of Loop.	40	24 O. D.
	From near Greensburg, Kan., northeast.	34.5	24 O. D.
	From near Haven, Kan., northeast.	40.6	24 O. D.
	From near Olpe, Kan., northeast.	32	24 O. D.
	From near Louisburg, Kan., northeast.	47	24 O. D.
	From Houstonia, Mo., northeast.	33	24 O. D.
	From Centralia, Mo., northeast.	22.6	22 O. D.
	Southwestern Kansas (Gathering Lines)	61	10, 16, 18

COMPRESSOR STATIONS

Location	Total Capacity
5 miles east of Wilmot, Ark. 4 miles S. E. of Lula, Miss.	2500 hp 1890 hp.
Montezuma, Ind. (2)	2600 hp.‡
Zionsville, Ind. (4)	5200 hp.
Baker, Mont. (1)	950 B. hp.
Gray Okla. Bloom, Kan. Harper, Iowa	1250 hp. 1250 hp. 1250 hp.
Skellytown, Texas Mullinville, Kan. Beatrice, Neb. Bushton, Kan. Bushton, Kan. Oakland, Iowa Mason City, Iowa	4000 hp.[2] 5200 hp.[3] 5200 hp.[3] 3900 hp.[4] 2600 hp. 1800 hp. 2400 hp.
Near Quinton, Okla.	920 hp.
Oklahoma City, Okla.*	230 hp.
Liberal, Kan.	7000 3000†‡ 10,000 B. hp.
Greensburg, Kan.	3900 3900†‡ 7800 B. hp.
Haven, Kan.	3900 3900†‡ 7800 B. hp.
Olpe, Kan.	3900¶ 3900†‡ 7800 B. hp.
Louisburg, Kan.	5000 2000†‡ 7000 B. hp.
Houstonia, Mo.	5200 1300†‡ 6500 B. hp.
Centralia, Mo.	3900 2600†‡ 6500 B. hp.

*In progress. †Proposed Construction. ‡Added to existing stations. [1]Built by Panhandle Eastern Pipe Line Company assisted by Missouri Power & Light Company.
[2]Increased from 3000 hp. [3]Increased from 3900 hp. [4]Increased from 1300 hp.

(Continued on Page 20)

burg and Frankfort, by May 26; Crawfordsville, June 7; Romney, Linden, Attica and Williamsport, by June 18, and Lafayette, June 21. It is expected that the change-over will be completed in Lafayette by July 24. A deadline of August 1 has been set for completion of the entire program.

Special crews of change-over men have been trained for the work. Approximately 15,000 meters are involved. Last fall the company installed natural gas in New Castle for residential and commercial use. Natural gas previously had been available only for industrial customers.

Construction crews of the Michigan Gas Transmission Corp. have already started work on the tie-in lines which will connect the main pipe line at two points with the Public Service company distribution system. One line, approximately 21 miles long, will be built north from the main pipe line to Crawfordsville. The second tie-in, approximately 14 miles long, will connect at Lebanon. The longer line will be 6-inch seamless, welded high-pressure pipe, and the line to Lebanon will be of 4-inch capacity.

The Noblesville and Tipton section of the company's territory was chosen for the first activity because of the close proximity of these communities to the main Michigan Gas Corp. line. By the time the change-over of appliances has been completed in these towns, it is expected that the tie-in lines to Crawfordsville and Lebanon will have been completed.

Further plans in Michigan Gas Transmission's 1937 construction schedule call for the installation of two 1300-hp. engines in the Montezuma compressor station and for the construction of a new station at Zionsville, both in Indiana. The Zionsville station, being built to accommodate the growing demand for gas in the Detroit area, will contain four 1300-hp. units. The corporation has also arranged to deliver gas to the Washtenaw Gas Co. for distribution at Ann Arbor, Mich., and vicinity. Approximately 21 miles of 6-inch line will connect the corporation's 22-inch line near Carlton, Mich., to the lines of the Washtenaw company.

A major Mid-west development of the past year was the change-over of Moline, East Moline, and Rock Island, Ill. The change-over was made in October, 1936 (*G A S*, Oct., 1936, p. 78), the gas being supplied by the Natural Gas Pipelines Co. of America. The area, including the Illinois town of Silvis, comprises approximately 20,000 meters, with a population of over 70,000.

In the Kansas and Oklahoma territory served by Cities Service Gas Co., Bartlesville, Okla. natural gas advanced upon numerous small communities. Some dozen of these communities with a combined population of approximately 10,000 inaugurated natural gas service during the past year.

Completed in August, 1936 (*G A S*, Aug., 1936, p. 102) was the 350-mile project of the Kansas Pipe Line and Gas Co., which covered an extensive territory in Central and Western Kansas and in Western Nebraska. Service to numerous towns in the service territory was augmented, and the communities of Paxton, Sutherland, and Hershey in Nebraska have added natural gas service. The Kansas Pipe Line and Gas Co. sells chiefly at wholesale with the Nebraska Gas Fuel Co., Western Public Service Co., Southern Nebraska Natural Gas Co., and the Producers Gas Co. as distributing companies.

Missouri cities adding natural gas service in 1936 were Excelsior Springs and Liberty, served by the Missouri Power & Light Co., Jefferson City, Mo. and Higginsville, served by the Gas Service Co., Kansas City, Mo. The three towns have a total population of approximately 12,000.

Northern Natural Gas Co., Omaha, has completed 107 miles of 20-inch line between Hugoton and Mullinville, Kan., and has currently in progress another 20 miles of 20-inch line connecting Clifton and Washington, Kansas. This line will parallel the existing 24-inch line and will provide additional capacity on this section of the system. During the past year the company has made additions to seven compressor stations in its system, increasing their total horsepower from 11,700 to 25,100.

Expansion in the South

In the southern and southwest sections of the country active expansion has been carried on by several companies. Southern Gas & Fuel Co., Houston, Texas, added 25 miles of 16-inch loop lines along the Baton Rouge to New Orleans carrier in Louisiana. (*G A S*, Feb., 1937, p. 46). The pipe was laid in four sections, tying together previously constructed loops. The project was completed in October, at a cost of $500,000.

Largest project to be completed in the southern sector was the $2,500,000 Rodessa field improvement of the United Gas Public Service Co., Houston. (*G A S*, Feb., 1937, p. 38). The project consisted of the construction of a gathering system made up of 14 miles of large diameter pipe with 18 miles of small diameter laterals emerging, the addition of an 8000 hp. compressor station and gasoline plant at Myrtis, and the laying of 20 miles of 18-inch line leading from the gasoline

NEW GAS TOWNS

(Continued from Page 17, Col. 2)

natural gas); Lansing, 78,397 (27,774 meters) (Converted from manufactured to natural gas).

Grand Rapids Gas Light Co., Grand Rapids, Mich.: Grand Rapids, 168,592; Grandville, 1,346; Rockford, 1,613; Sparta, 1,939.

Panhandle Eastern Pipeline Co., Kansas City, Mo.: Detroit, 1,568,662.

MISSOURI

Gas Service Co., Kansas City, Mo.: Higginsville, 3,339.

Missouri Power & Light Co., Jefferson City, Mo.: Excelsior Springs, 4,565; Liberty, 3,516.

NEBRASKA

Kansas Pipe Line and Gas Co., Salina, Kan.: Hershey, 473; Paxton, 507; Sutherland, 753.

Northern Natural Gas Co., Omaha, Neb.: Thurston, 236 (19 meters).

NEW YORK

Republic Light, Heat & Power Co., Buffalo, N. Y.: Akron, 2,188; Attica, 2,212; Alexander, 212; Batavia, 17,375; Corfu, 418; East Pembroke, 540; Oakfield, 1,919.

(Prior to 1926 the above towns with the exception of Oakfield were on natural gas. From 1928 to 1936 Oakfield was served with mixed gas.)

NEW MEXICO

El Paso Natural Gas Co., El Paso, Texas: Silver City, 3,519.

OKLAHOMA

Cities Service Gas Co., Bartlesville, Okla.: Shidler, 1,177.

SOUTH DAKOTA

Northern Natural Gas Co., Omaha, Neb.: Elk Point, 1,294 (210 meters).

TEXAS

Arkansas Louisiana Gas Co., Shreveport, La.; Talco, 421.

Delhi Gas Co., Delhi, Okla.: Borger, 6,532.

United Gas Public Service Co., Houston, Texas: Banquete, 319.

Lone Star Gas Co., Dallas, Tex.: Vickery, 427.

J. W. Moore & Son, Goldthwaite, Texas: Goldthwaite, 1,324.

DOMINION OF CANADA

Dominion Natural Gas Co., Ltd., Buffalo, N. Y.: St. Thomas, 16,026 (2,350 meters).

Union Gas Company of Canada, Ltd., Chatham, Ont.: Appin, 125 (31 meters; Byron (56 meters); Mt. Brydges, 479 (75 meters).

GAS TRANSMISSION LINE AND COMPRESSOR STATION CONSTRUCTION—1936-1937

(Continued from Page 18)

TRANSMISSION LINES (Five Miles or More in Length)				COMPRESSOR STATIONS	
Company	Location of Line	Length (Miles)	Size (Inches)	Location	Total Capacity
Panhandle Eastern Pipe Line Co., Kansas City, Mo. (Continued)				Pleasant Hill, Ill.	2600 2600†‡ 5200 B. hp.
Panhandle Illinois Pipe Line Co., Kansas City, Mo.	From Pleasant Hill, Ill., northeast.	19	22 O. D.	Glenarm, Ill.	4000 1000†‡ 5000 B. hp.
				Tuscola, Ill.	3900† B. hp.
Penn-York Natural Gas Corp., Buffalo, N. Y.	From Harrison Field, Pa. to Arcade, N. Y. From Arcade to Sheridan, N. Y. From Arcade to Clarence, N. Y.	57.2 42 31	10 8 8		
Peoples Natural Gas Co., Pittsburgh, Pa.	From Hebron Twp., Potter County, connecting with Pew Compressor Sta. near Limestone, Clarion County.	105	12		
Pittsburgh & W. Va Gas Co., Pittsburgh, Pa.	Grafton to Lumberport, W. Va.	12	12		
Public Service Corp. of Texas, Fort Worth, Texas	From Booker, Texas to the Phillips Petroleum Co.'s Compressor Station at Darrouzett and Spearman Stations on their gasoline line from the Texas Panhandle-St. Louis line.	6 9 15	4½ 4		
San Diego Consolidated Gas and Electric Co., San Diego, Calif.	From 3 miles south of Carlsbad to Escondido.	11 4 15	3 2½		
Shamrock Oil & Gas Corp., Amarillo, Texas	South Moore County, Texas[5]	8	6		
	From McKee Gasoline Plant to Eastern Moore County[6]	6	20		
Southern California Gas Co., Los Angeles, Calif.	From Buttonwillow-Semitropic Field System to existing production trunk line near South Belridge.	9.26	10 & 12		
	From Ten Sections Field System to existing transmission system.	6.73	12		
	Bakersfield Transmission System†	7	10		
	Kettleman-Fresno Transmission System†	7	10		
	Taft-Los Angeles Transmission System.†	13	22		
	San Joaquin Valley†	10	4 to 8		
	Redlands Area—along Highway 99 to supplement service to Hemet, San Jacinto, Beaumont and Palm Springs.	10	6		
Southern Gas & Fuel Co., Houston, Texas	Loop lines along the Baton Rouge, La. to New Orleans' main line.	25.44	16		
S. W. Gas Utility Corp. of Oklahoma, Ada, Okla.	Hughes County.	12.3	6⅝ O. D.		
Standard Pacific Gas Line, Inc., San Francisco, Calif.	From McDonald Island Field to Stanpac Line (8 miles north of Tracy)	13	8		
Stryker Gas Co., Fredonia, Kan.	From 2½ miles north of Severy to Severy.	2.67	4		
Union Gas Co. of Canada, Ltd., Chatham, Ontario	Glencoe to London, Ontario.[7]	30	10		
United Gas Public Service Co., Houston, Texas	Relocation of Dallas-Fort Worth Main Line around Mt. Creek Reservoir, near Dallas, Texas.	5.48	16	Myrtis, La.	8000 B. hp.
	From the Pensacola 12-inch line near Pensacola to Naval Air Station at Pensacola, Florida.	5.49	6		
	From the Rodessa Gasoline Plant near Myrtis, La. to the Sarepta Latex 16-inch lines.	20.30	18		
	From the Lathrop Oil Field 4-inch Line to the 6-inch Gladewater Oil Field tie-across line.	5.30	4		
West Texas Gas Co., Lubbock, Texas				Plainview, Texas (1)	920 B. hp.

*In progress. †Proposed Construction. ‡Added to existing stations.

[5]Gathering lines connecting to Panhandle Eastern Pipe Line Company's Texas Panhandle Main Line.

[6]This line is an extension of an existing gathering system.

[7]This line was a duplication of that portion of the Dawn-London line laid in 1935 lying nearest to London.

plant to the main transmission line between the Monroe Field and the Latex compressor station. The company also reported the additions of line extensions in Texas, Florida, and Louisiana.

A West Virginia development completed last year was the 95-mile, 12-inch line between Clendenin and Hastings constructed by Hope Natural Gas Co., Pittsburgh, Pa. (*GAS*, Jan., 1937, p. 48).

A noteworthy project of the Lone Star Gas Co., Dallas, Texas, was the 108-mile 20-inch line connecting Irving to Cayuga and Long Lake fields.

Principal expansion activity last year in the Southwest area was carried on by El Paso Natural Gas Co., El Paso, Texas, which constructed over 150 miles of line in bringing natural gas to Silver City, New Mexico, and to the Arizona communities of

(Continued on Page 105)

Record Annual Conference Of Distribution Men Held In Washington, April 12-14

GAS STAFF REPORT

THE largest and the best—that was the consensus of the 400 men and 150 women attending delegates regarding the fourteenth annual Distribution Conference of the American Gas Association, held April 12, 13, and 14 at the Wardman Park Hotel during the gala period of Washington, D. C.'s cherry blossom time. The delegates gathered from far flung sections of the country—Los Angeles, Boston, Toronto, and New Orleans. The meetings were attended to capacity, and ample time was provided for informative discussions.

Under the leadership of D. P. Hartson, Equitable Gas Co., Pittsburgh, chairman of the Conference, and following the excellent arrangements made by H. W. Hartman, secretary from American Gas Association headquarters, who was ably assisted by the staff of the Washington Gas Light Co., the program was carried through in a lively and precise manner.

On Monday morning, April 12, activities opened with the remarks of Chairman Hartson, and the delegates were welcomed to the Nation's capital by Marcy L. Sperry, president of the Washington Gas Light Co., who stated in his address that precedent should not be held as the guide to the industry's future policies and thought. Mr. Sperry further emphasized that the industry must keep down the cost of its heating service to properly cope with competition.

George W. Bean, fuel consultant, of Washington, in his address, "The Necessity for Cooperation between Distribution and Utilization Departments in Government Contracts," brought out the point that local distribution departments are important factors in assisting fuel consultants in obtaining government business and contracts accomplishing this purpose by cooperating with local government officials, educating and assisting them in the use of gas.

The most important work of the distribution department in the house heating program, stated H. B. Johns, of Peoples Gas and Coke Co., Chicago, in his paper, is to make sure that the sales and other departmental procedures in each installation are properly made, thus insuring coordination and understanding in each installation, which will in turn mitigate the necessity for corrective service calls after installation. A discussion on the subject of "Shade Tree Protection" as affected by the various phases of the natural gas industry was offered by A. Gordon King, service engineer of the American Gas Association.

President Marcy L. Sperry of the Washington Gas Light Company welcomes the delegates.

A highlight of the Monday morning meeting was a presentation by E. A. Munyan, Union Light, Heat & Power Co., Cincinnati, Ohio, on the difficulties and experiences encountered in coping with the floods which ravaged the Ohio Valley earlier in the year. A resolution, introduced by F. M. Goodwin, manager of operations, Boston Consolidated Gas Co., Boston, Mass., providing that the Distribution Committee express its admiration for the gas distribution engineers who so ably carried on during the flood period was enthusiastically carried.

Featured during Monday afternoon were various round table luncheon conferences. These included the following groups: Meters, led by H. B. Andersen, United Gas Improvement Co., Philadelphia; Customers Service, led by C. E. Muehlberg, Consolidated Edison of New York; Pipe, led by L. W. Tuttle, Public Service Co. of Northern Illinois; Portable Equipment, E. H. Eacker, Boston Consolidated Gas Co.; and Employee Training, led by H. G. Horstman, Public Service Co. of Indiana, Indianapolis, Ind. The round table discussions were held in separate rooms, no records were kept, and the freedom of speech afforded brought out lively discussions.

On Sunday evening, preceding the opening of the conference, a dinner, at which preliminary plans were brought to a final focus, was held. This meeting, under the leadership of Messrs. Hartson and Hartman, was attended by all concerned with the management of the conference and by all who were scheduled to appear on the program.

The Tuesday morning session of the conference opened with the report of the Committee on Pipe Coatings and Corrosion, presented by Chairman C. F. Turner, the East Ohio Gas Co., Cleveland, Ohio.

The program continued with the address of Dr. Lyman J. Briggs, director of the National Bureau of Standards in Washington, who invited the delegates on an inspection trip of the Bureau during the afternoon. He stressed the desire of the Bureau to cooperate with the gas industry and prompted members to make use of the Bureau's facilities as often as possible.

The paper of Dr. Scott Ewing, Research Associate of the National Bureau of Standards, which was a feature of the Tuesday morning session, is presented in digest form on Page 23 of this issue of G A S.

Animated motion pictures showing the behavior of electric currents on soil during corrosion and cathodic protection processes made graphic and interesting the address of A. V. Smith, United Gas Improvement Co., Philadelphia, Pa. on "The Theory and Use of Cathodic Protection."

"The Precision Method of Locating Gas Leaks" presented by E. F.

A PIPE JOINT luncheon (left) attended by the subcommittee on pipe joints and materials. (Left to right) K. R. Knapp, Cleveland; H. L. Gaidry, New Orleans; D. P. Hartson, Pittsburgh; S. P. Cobb, New York; George J. Heckendorn, Denver; H. L. Peden, New York; A. H. Abbott, Minneapolis; W. A. Dunkley, Memphis; L. W. Tuttle, Chicago; C. S. Nairne, New Orleans.

Photographs, Courtesy American Gas Association

SIX GAS MEN far from home: (Front row—left to right) C. D. Robison, Omaha; J. D. von Maur, Toronto; H. L. Gaidry, New Orleans. (Back row—left to right) Guy Corfield, Los Angeles; Martin I. Mix, Chicago; F. M. Goodwin, Boston.

LAUGHING DUET: (below) L. A. Dixon and Willard F. Rockwell, both of Pittsburgh.

Schuldt, Peoples Gas Light and Coke Co., Chicago, attracted great interest through the exhibition of a model of the leak locating gas apparatus. The "Leak Locator" places gas leaks by measuring the drip in gas pressure accompanying the leak.

A large group of delegates on Tuesday afternoon visited the Bureau of Standards. The group, which was divided into smaller sections, each provided with a guide, made a tour of the various buildings, inspecting the standardization methods, materials tested, and the work and specimens collected by Dr. Ewing.

Wednesday Sessions

The Wednesday morning meeting opened with the report of the Committee on Meters and Metering, presented by Chairman D. P. Allen, of the Washington Gas Light Co., Washington, D. C.

Considerable discussion followed L. W. Tuttle's presentation of the report of the Committee on Pipe Joints and Pipe Materials as to details of application and make-up of leak clamps. It was generally considered advisable to develop standardized procedure.

"Further Use of Carboseal in Reducing Joint Leakage" was the subject presented by R. E. Finley, The Dayton Power & Light Co., Dayton, Ohio. The discussion brought out that in general Carboseal was effective, and, for a single application, was considerably more economical than the procedure of applying leak clamps.

On Wednesday noon luncheon meetings were held by both the Pipe Coatings and Corrosion and the Pipe Joints and Pipe Materials subcommittees. Lively discussion was a feature of both luncheon gatherings.

Three addresses featured the sessions of Wednesday afternoon: "Changes Occurring in a Distribution System as a Result of Changes in the Characteristics of the Gas Supplied," by C. D. Robison, Metropolitan Utilities District, Omaha, Nebraska; the report of the Committee on Gas Main Structural Strength, Erick Larson, chairman, Long Island Lighting Co., New York, N. Y.; and the report of the Committee on Cast Iron Pipe Standards, C. C. Simpson, chairman, Consolidated Edison Co. of New York.

Open Forum

An open forum bringing into general discussion the highlights of the luncheon conferences concluded the sessions. The papers presented before the conference will be given treatment in future issues of GAS.

Members of the Distribution Committee who actively participated in the management and program of the meetings are as follows:

D. P. Hartson, chairman, Equitable Gas Co., Pittsburgh, Pa.; H. L. Gaidry, vice-chairman, New Orleans Public Service, Inc., New Orleans, La.; G. H. Boyd, ex-officio, Consolidated Edison Co., of New York, New York, N. Y.; D. P. Allen, Washington Gas Light Co., Washington, D. C.; H. B. Andersen, The Philadelphia Gas Works Co., Philadelphia, Pa.; J. H. Braine, The Brooklyn Union Gas Co., Brooklyn, N. Y.; E. H. Eacker, Boston Consolidated Gas Co., Boston, Mass.; O. H. Folger, Public Service Electric & Gas Co., Hackensack, N. J.; Lee Holtz, Southern California Gas Co., Los Angeles, Calif.; H. G. Horstman, Public Service Co. of Indiana, Indianapolis, Ind.; Erick Larson, Long Island Lighting Co., New York, N. Y.; Wm. Lawton, Jr., City of Richmond Gas Department, City Hall, Richmond, Va.; C. C. Simpson, Consolidated Edison Co. of New York, New York, N. Y.; R. H. Taylor, Public Service Co. of Colorado, Denver, Colo.; C. F. Turner, The East Ohio Gas Co., Cleveland, Ohio.; L. W. Tuttle, Public Service Co., of Northern Illinois, Oak Park, Ill.; C. H. Waring, Kansas City Gas Co., Kansas City, Mo.

Engineering Principles Applied to Soil Corrosion Problems

By SCOTT EWING

Research Associate
National Bureau of Standards
Washington, D. C.*

IT IS the purpose of this paper to outline the soil corrosion problem in a broad general way and to show how apparently unrelated data from various sources can be brought together to devise a general scheme which is consistent with all of the data. Certain general principles are as true in soil corrosion as they are in most other branches of engineering.

SCOTT EWING

A natural outgrowth of the tests of pipe coatings would be the development of tests and specifications to insure the use of suitable pipe coating materials. The means which may be used to develop these specifications will be described briefly. Details will be presented more fully in a manual on pipe line corrosion which is now being prepared.

Pipe Line Corrosion

1. *Sources of Data*†. The data on which the following description of the corrosion process is based are: (1) measurements of pit depths and losses of weight of the ferrous materials in the soil corrosion investigation of the National Bureau of Standards. These data include measurements on about 5500 specimens exposed from 2 to 12 years in 47 test sites distributed over the country; (2) service replacement records of a large gas company over a period of about 35 years; (3) the leak record over a period of 40 years on a 38-inch water conduit 26 miles long; (4) the record of leaks and repairs on about 500 miles of oil lines of various ages ranging up to as many as 47 years.

2. *The Soil Corrosion Process.* The corrosion of a pipe line is in many respects unique among corrosion problems: (1) The pipe line is out of sight. Appearance, which is so important in the case of automobiles, bridges, cutlery, etc., is not a consideration. (2) Once the pipe line is covered it cannot be readily exposed again. Hence its condition cannot be easily observed and additional protection applied when the original protection is no longer effective. (3) Considerable corrosion can occur on a pipe line without any reduction in its efficiency. Heavy surface rusting is to be expected whenever a bare pipe is buried, but it is only when pits puncture the pipe wall and cause leaks that corrosion causes any loss or expense.

In soils the conditions are generally favorable for some corrosion. There is always some moisture at pipe depth, and usually a moderate supply of oxygen. The soil may contain considerable acid and/or soluable salts, and may have either an acid or alkaline reaction. Although there is always some corrosion, it is not always important in pipe line operation. In many soils the pipe will last almost indefinitely without developing an appreciable number of leaks.

In soils the conditions are generally favorable for some corrosion. There is always some moisture at pipe depth, and usually a moderate supply of oxy-

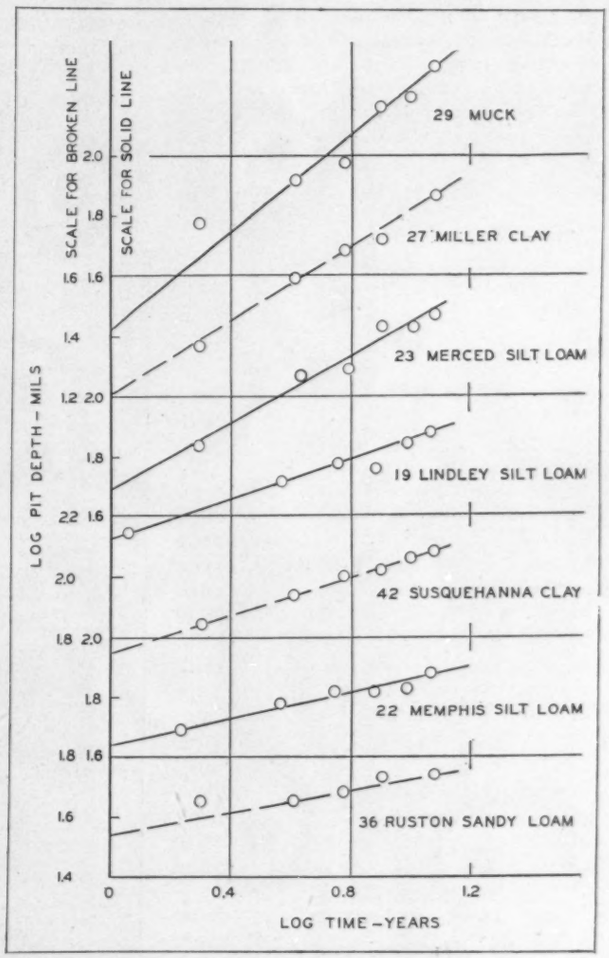


FIG. 1. Pit depth-time curves of typical soils.

*Excerpts from a paper, "Engineering Principles Applied to the Soil Corrosion Problem," presented before the American Gas Association Fourteenth Annual Distribution Conference, Wardman Park Hotel, Washington, D. C.; April 12, 13 and 14, 1937.

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gen. The soil may contain considerable acid and/or soluble salts, and may have either an acid or alkaline reaction. Although there is always some corrosion, it is not always important in pipe line operation. In many soils the pipe will last almost indefinitely without developing an appreciable number of leaks.

The process of corrosion in soils may be considered as a somewhat special case of the general electrochemical theory of corrosion with which it is assumed the reader is familiar.

When the pipe line is buried the pipe surface in contact with the soil becomes either anodic or cathodic. At the anodic areas ferrous ions formed by solution of the metal combine with negative ions, such as OH, O, HCO_3 and CO_3, which are concentrated at the anode under the influence of the electric current. These compounds, if soluble, diffuse out into the soil. If there is an abundance of oxygen in the soil the ferrous salts and hydroxide do not move very far before the iron is oxidized and precipated as the less soluble ferric hydroxide. The negative ions, released by precipitation of iron, then migrate back toward the bottom of the pit to combine with more ferrous ions. Hence every anodic area or pit is a trap for negative ions. They are driven toward it by the current; there are few positive ions except iron with which they can combine, and the ferrous salts cannot diffuse far from the pit because the iron is oxidized and precipitated in solutions containing oxygen. The white deposit often observed in freshly exposed pits is composed mostly of ferrous compounds.

The zone at which ferric hydroxide is precipitated depends upon the rate at which oxygen is supplied by the soil and the rate at which ferrous salts are formed in the pit. Ferrous hydroxide also combines with ferric hydroxide to form magnetic oxide where the oxygen supply is limited; but this product is crystalline and has little effect on the oxygen movement and salt diffusion (1) of ferrous salts out of the pit. If there is an abundance of oxygen, ferric hydroxide is precipitated close to the pipe surface, while a rapid formation of iron salts would tend to make the place of deposition farther from the pipe surface. In either case this zone of precipitation is a relatively thin nearly hemispherical shell around the pit.

The membrane formed by the precipitation of ferric hydroxide tends to prevent the diffusion of oxygen and ferrous salts through it. This membrane tends to become very dense since it is in it or very near it where the oxygen and ferrous salts must meet. The size of the tubercle is increased if the solution in it is corrosive and if the oxygen supply is deficient. Whether it is large or small, the membrane of the tubercle will ultimately become so dense that neither oxygen nor ferrous salts can diffuse through it. When this stage is reached the solution inside the tubercle is saturated with iron salts and corrosion in the pit practically stops. Occasionally, however, the membrane is broken, the iron salts diffuse through the opening, and corrosion proceeds again until another impervious membrane is built up.

It is evident that if the oxygen supply is somewhat restricted and if the soil is strongly acid or contains a considerable amount of soluble salts, the concentration of negative ions in the pit will become high and the amount of iron that will go into solution will also be high. Hence the pit will become rather deep before it becomes inactive. Conversely, if the soil solution is not particularly corrosive and if there is an abundance of oxygen, the pit will become inactive before it becomes very deep.

After the pit has become inactive it does not follow that corrosion ceases. Since the concentration of hydrogen or the concentration of alkali on cathodic areas will not be maintained if the pit is inactive, some point in the previously cathodic area will become anodic, there now being no cathodic protection. Another pit will then start to form at some other place and the process will repeat itself. The net result is that in a well drained soil the pipe surface is finally covered with a layer of rust and the pipe surface is corroded slightly. If the soil is very mildly corrosive the rust layer is thin and closely adherent. If the soil is more corrosive, the rust layer is thicker and more tubercular and the pits are deeper. The corrosion of a pipe in a well drained soil is thus not the gradual penetration of a more or less fixed and large number of pits, but the relatively rapid penetration of a relatively few pits, which become inactive after a time. Naturally, the longer the pipe is buried, other conditions being equal, the greater the deepest pit is likely to be, simply because there is a greater number of pits with the same average depth. But the rate of penetration of the deepest pit is not constant.

If oxygen is absent or decidedly limited, corrosion over the pipe surface is more uniform, and the penetration of the pipe wall continues until the pipe is destroyed. Corrosion continues without interruption under conditions of poor aeration because a protective membrane of ferric hydroxide is possible only when oxygen is present.

The cathode reaction in soils consists primarily in depolarization of hydrogen by oxygen, but in a few poorly drained soils some evolution of hydrogen probably occurs. It has been shown (2) that bacteria in some very poorly drained soils are capable of depolarizing hydrogen by extracting oxygen from sulphates in the soil.

The rate of cathode depolarization is determined by the permeability of the soil and the corrosion products which are deposited in the cathode. These products retard the flow of oxygen to the cathode and hence reduce the rate of corrosion. These films may consist of hydroxides and oxides of iron or carbonates of calcium and magnesium. Their formation is favored by aeration, is retarded by acidity and high concentrations of chlorides and sulphates in which the carbonates are appreciably soluble.

It is thus seen that although an abundance of oxygen tends to concentrate the corrosion in pits, it also tends to reduce the corrosion rate. It will be shown later that the rate of pitting, under conditions of good aeration, although initially great, falls off rapidly with time.

3. *The Occurrence of Leaks as a Measure of Corrosiveness.* The discussion of pipe coatings, corrosion and valuation has always centered around the idea of pipe life, about which very little is known.

(Continued on Page 106)

Calendar

May

Pennsylvania Gas Association — Sky Top Lodge, Sky Top, Pa., May 4-6.

American Gas Association, Natural Gas Department—Civic Auditorium, Kansas City, Mo., May 10-15.

American Gas Association, Production and Chemical Conference—New York City, N. Y., May 24-26.

June

American Gas Association, Industrial Gas Section — Industrial Gas Sales Conference, Chicago, Ill., June 8-9.

Canadian Gas Association—30th Annual Convention, Chateau Laurier Hotel, Ottawa, Canada, June 10-11.

American Society of Heating and Ventilation Engineers—New Ocean House, Swampscott, Mass., June 24-26.

July

Michigan Gas Association—Grand Hotel, Mackinac Island, Mich., July 1-3.

August

Pacific Coast Gas Association — Olympic Hotel Seattle, Wash., Aug 17-19.

September

American Gas Association—Cleveland, Ohio, week of September 27.

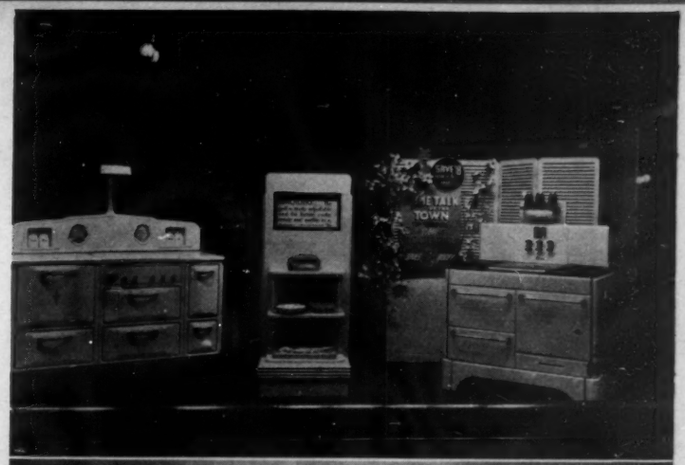
October

American Society for Metals—1937 Metal Congress and Exposition, Atlantic City Auditorium, Atlantic City, N. J., October 18-21.

Chicago Exposition of Power and Mechanical Engineering — New International Amphitheater, Chicago, Ill., October 4-9.

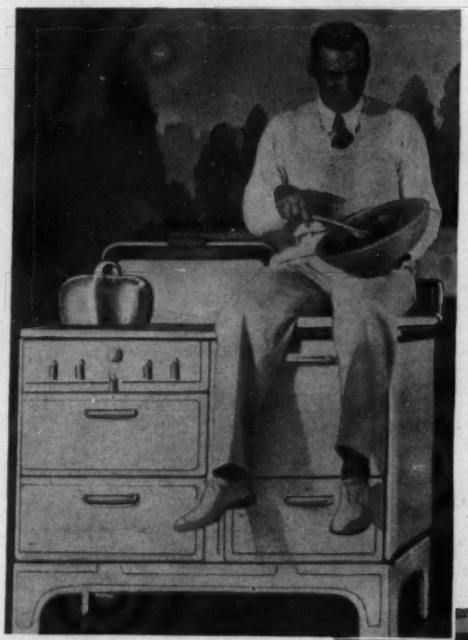
GAS CAMERA

GAS Camera welcomes photographs of gas industry personalities at work and at play. Pictures should be clear, and poses, informal.



CONTRAST (right)

White appliances framed in black feature the above window display of Pacific Gas and Electric Company, San Francisco. The window was used in the company's recent dealer range campaign. BELOW: Cheerfully brilliant was the appliance display in the booth of the Northern Indiana Public Service Company at the Home Show, Fort Wayne, Ind.

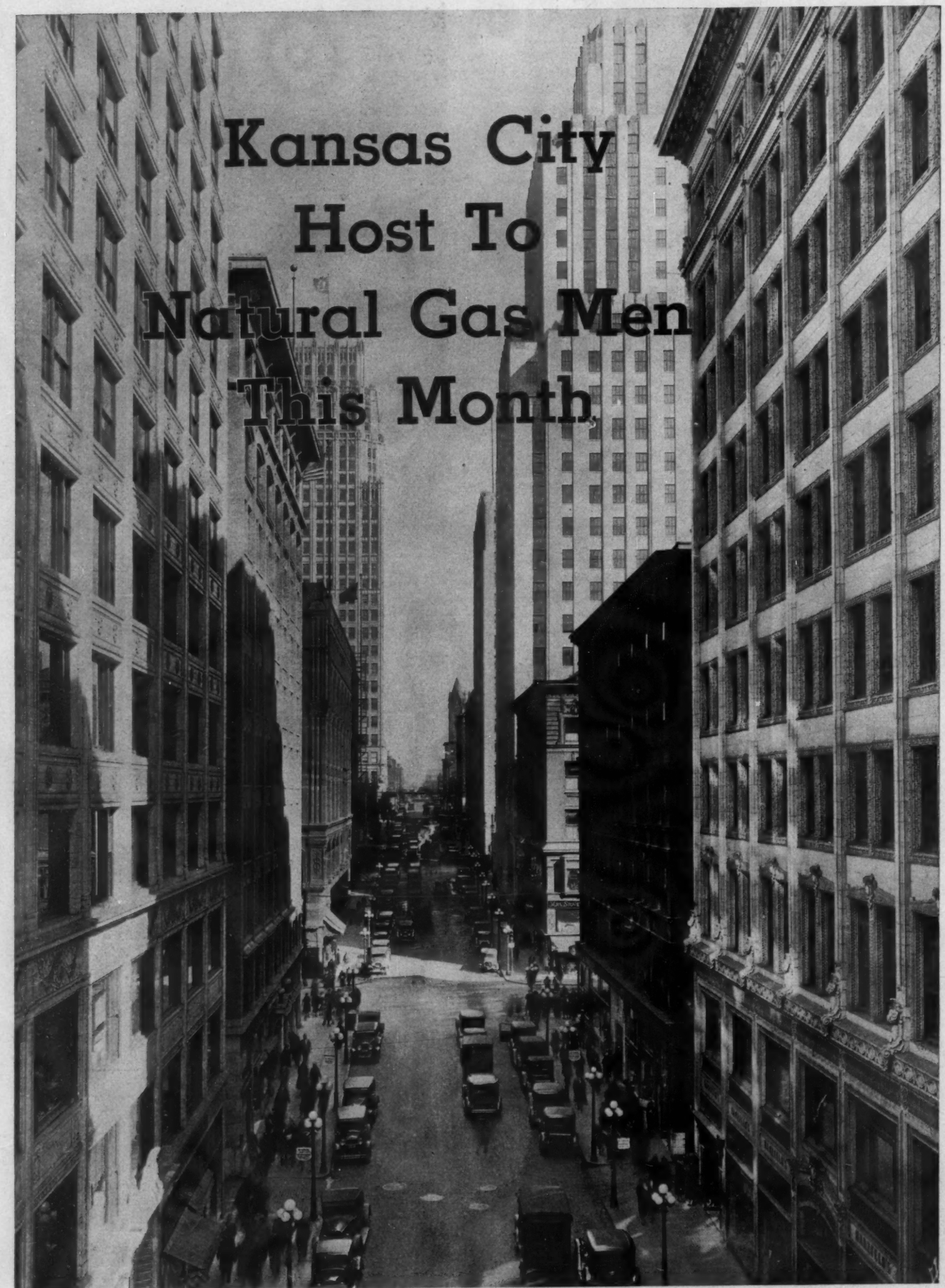


FRANK DECATUR WHITE, famed cooking expert, experiences a "comfortable" warmth, as he sits upon a gas range, which registered 325° F. when it was turned off a few seconds before the picture was taken. However, Mr. White proved his point to those attending the cooking school conducted for the Community Natural Gas Co., Abilene, Texas, that one of the features of the modern gas range is its ability to retain heat, affording economy in cooking.

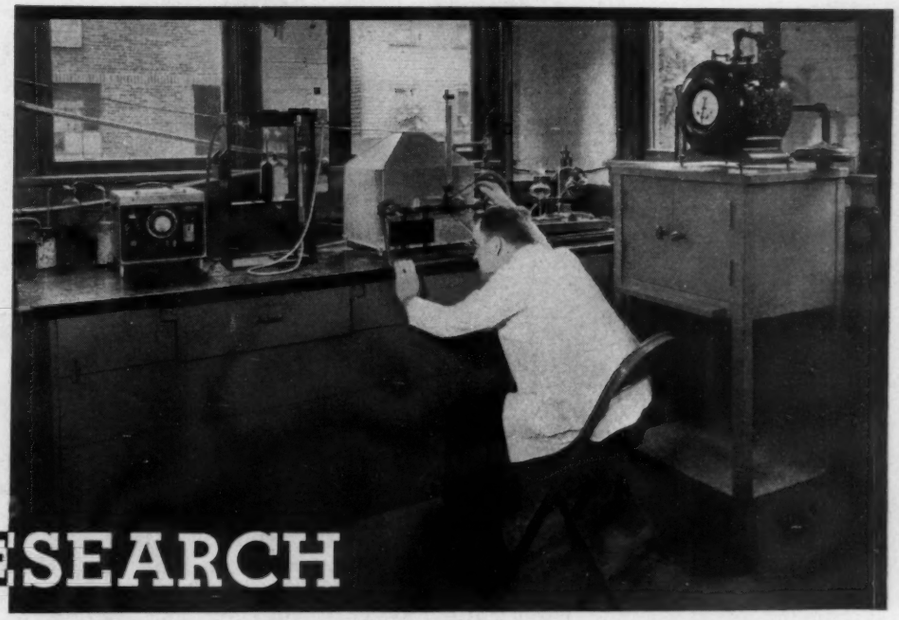
NATTILY ATTIRED in new uniforms is this imposing group of Laclede Gas Light Company meter readers. The uniforms, of oxford gray, carry a badge-like emblem on the left sleeve. The company's name is stitched over the left breast pocket; its initials in red on each cap. The uniforms are for identification purposes.

COUNTER COOKERY: Latest types of gas counter cooking appliances were displayed at the National Hotel & Restaurant Sales Conference recently in Philadelphia. Shown are two coffee making units, a complete short order appliance baking oven, automatic toasters, grills, ovens, and various other appliances.

MRS. B. C. ADAMS, wife of the vice-president and general manager of the Gas Service Co., Kansas City, is serving as the chairman of the Ladies' Entertainment Committee for the Natural Gas Convention this month.



Kansas City Host To Natural Gas Men This Month



• A Laboratory attache studies the effect of port area, port size, and primary air-gas ratios on maximum safe gas rates.

RECENT RESEARCH ON DOMESTIC GAS RANGES

By F. O. SUFFRON

Supervisor, Pacific Coast Branch
American Gas Association Testing Laboratories

I BELIEVE we are all fully aware that the gas range in spite of extensive progress in other domestic gas utilization fields, still constitutes the base load of our industry; that the gas range is not only a most attractive target for our competitors but one being shot at with increasingly greater vigor if not better aim; that the gas range has become and must continue to be more and more a scientifically engineered, streamlined cooking machine instead of just a stove, in order to meet modern requirements of automatic performance and beauty; and, finally, that as the knowledge of food chemistry and food preparation by application of heat becomes more comprehensive and exact, the requirements of temperature control and heat application for any cooking appliance will become more rigid. If we recognize these facts we must of necessity admit the need now and in the future of constant endeavor to improve through the medium of research and development the application of gas heat to cooking processes. As in the past, we must continue in the future to rely greatly on the initiative and ingenuity of our appliance manufacturers in such improvement work. However, they should not be expected to shoulder this responsibility alone, particularly as the needs of the times are demanding greater progress than ever before in our history. The American Gas Association recognizes its responsibility in this direction. Its Executive Board inaugurated in 1935 a program of fundamental research on gas ranges under the guidance of the Committee on Domestic Gas Research, of which F. J. Rutledge, vice-president of The United Gas Improvement Co., is chairman. This program has been vigorously prosecuted at the Testing Laboratories of the Association.

F. O. SUFFRON

Work thus far performed has included studies of oven, broiler and top section performance, and has involved such factors as combustion, heat losses, insulation, venting, efficiency and speed. It is my purpose to summarize briefly certain of the results so far obtained.

Heat losses from ovens may be generally classified as flue losses and wall losses. Both of these represent a distinct and unrecoverable loss of energy, and if conditions can be altered to decrease this loss, heat inputs required to preheat the oven and to maintain it at any temperature will be reduced.

Flue Heat Losses

In general, little can be done to reduce the flue temperatures of gases emitted from the oven proper, since such temperatures are, obviously, of approximately the same magnitude as the temperature of the gases circulating in or around the oven itself. A great deal can be done in most cases, however, by reducing the volume of gases carried away through the flues, which consequently results in a reduction in the total heat loss.

The total volume of gases passing through the flue is dependent, in part, on the amount of excess air admitted to the ovens. If this volume can be reduced, then the total volume of products will be reduced in proportion and the heat losses will be less. In general, there are two means by which the flow of excess air can be restricted; first, by reducing the area of secondary air openings, and second, by placing restrictions in the

flueways. With conditions inherent with most ovens it seems that the minimum percentage of excess air which is needed for satisfactory combustion is in the neighborhood of from 50 to 75 per cent at the rated input to the oven. It is important to note that with excess air reduced to this point, it is necessary that most of the secondary air utilized be caused to pass through the combustion zone so as to be available for the combustion reaction. Consequently, it will be found advisable, generally, to so locate baffles in respect to burner ports that the proper direction of secondary air is effected.

When an oven equipped with a throttling thermostat reaches any particular temperature, the gas supply is throttled by thermostatic action and the percentage of excess air increases. Data collected during this investigation indicated that with changing gas rate due to thermostatic action, the total volume of flue gases remained substantially constant when reduced to standard conditions of temperature and pressure. Thus, any restriction which is incorporated to control the flow of excess air during the periods of maximum input will likewise affect the flow during the periods of reduced inputs, and it can be shown that the reduction in excess air supplied to an oven will effect a worthwhile decrease in the rate required to maintain a given temperature.

For example, it was found that in a special laboratory test oven a reduction in excess air, at the rated input of the oven, of from 200 to 50 per cent resulted in an excess air reduction of from 490 to 290 per cent during maintenance of a 500° F. oven temperature. The gas rate required to maintain this temperature was reduced 26.5 per cent by this reduction in excess air. Thus a very substantial economic advantage obviously results from more precise control of secondary air. The beneficial effect of such control was evidenced not only in a reduction in maintenance rates but also, as would be expected, in preheating inputs and preheating time. We must recognize, however, that in general, any appliance will become more critical in its performance as the percentage of excess air is decreased. Thus, to gain without sacrificing safety the economic and speed advantages possible with precise secondary air control, it will be necessary to insure accurate adjustment of appliances and possibly to provide for gas pressure control. No one can say at this time to what extent these definite objectives can be applied in practice in the future.

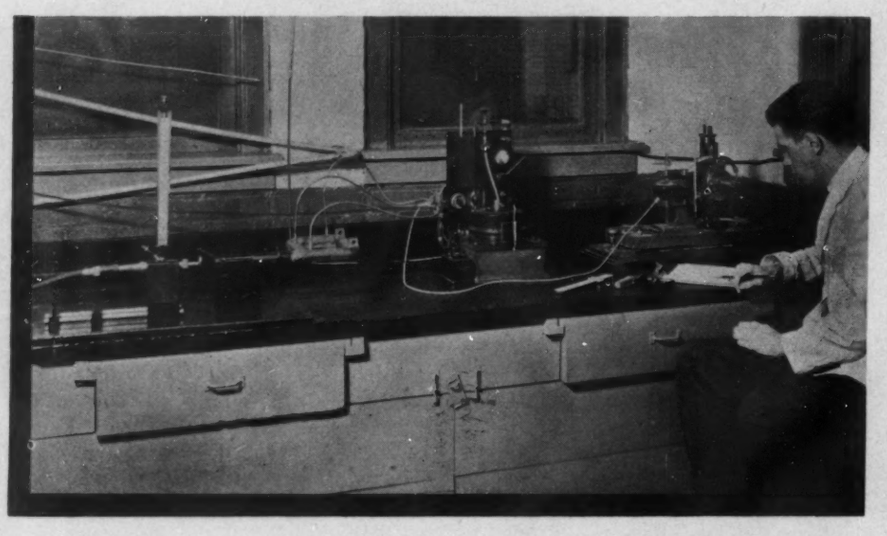
Heat losses resulting from heat flow through the walls of an oven are likewise important and controllable. A great many tests were made at the Laboratories to determine the effect of density and thickness of insulating materials on these losses. It will be well to pause at this point to explain that the usual conception of the duties of insulation is somewhat altered in the case of a gas range oven, in that one of the important periods of operation of an oven is the preheat cycle, wherein the heat capacity of the insulation is just as important a characteristic as its insulating value. That is to say, if an insulation is of such a composition that it absorbs relatively large quantities of heat, it will necessarily serve to retard the speed of preheating and to require greater preheating inputs, even though resistance of the insulation to heat flow during equilibrium temperature conditions may be very effective.

Measurements of the effectiveness of insulation during the preheating period are the amounts of gas or the time required to bring the temperature of the oven to a predetermined point. In general, on considering the more usual types of rock and mineral or slag wools, the preheating input increases as the density increases due to the increase in heat capacity or heat absorbing capacity of the insulation. This fact is particularly noticeable as the thickness of the insulation is increased. When the thickness of the insulation is being maintained at about 1 inch, there appears to be little effect exerted on preheating speed or input by changes in its density.

During maintenance periods the density of the material becomes of even greater importance, and it was found that as the density of insulation increased the wall losses decreased, and the amount of gas required to maintain a given temperature became less. This finding was of unusual significance in that it is contrary to the behavior of insulating materials at atmospheric or refrigeration temperatures. In addition, these data have practical significance in that insulation can be packed to greater densities than heretofore with the assurance that greater freedom from shifting and settling as well as better insulating value will be obtained.

Of great importance to a gas range designer is the subject of thickness of insulation. In discussing this subject, there are two factors which must be considered. One is the economical question of controlling heat losses which may be expressed as efficiency. The second is the reduction of surface temperatures, an item of extreme importance, since it influences to a large degree the temperature of the kitchen and the effect on the operator who must at times come close to and in contact with the surfaces. Furthermore, there is a distinct psychological problem, wherein a customer's impression of the effectiveness of insulation is influenced by the hot spots which may occur on the surface, regardless of the comparatively small effect these may have on the reduction in fuel. As the thickness is increased, the

(Continued on Page 76)



• Some of the apparatus used in studying the fundamentals of burner design.

Los Angeles city school domestic science installation, showing clock-controlled ranges and unit kitchen

Home Service Progress On the Pacific Coast

By GLADYS B. PRICE

Southern California Gas Company

THE Spring Sales Conference of the Pacific Coast Gas Association, held in Los Angeles on April 1 and 2, proved conclusively that home service has become an important part of practically every utility company. The trend in gas appliance sales promotion and advertising is to stress the tangible results to be obtained from a modern gas appliance rather than the intangible advantages of construction and economy. And where else can the utility find the answer to the query, "What will this particular appliance do for me?" except from home service women who have, for years, endeavored to teach women how to turn out perfect products!

At the present time in the P.C.G.A. there are seven dual utilities with a home service personnel of 23 and six gas companies with 34. It is most interesting to note that within the last four years departments have been created in four of the largest companies, one department has been reestablished, and all departments have been enlarged. Rather astounding when one realizes that these were "depression" years and home service departments were, in some instances, considered luxuries!

GLADYS B. PRICE

Of necessity, any department created in the uncertain years of 1933 and 1934 had to sell itself every step of the way and justify itself on the black side of the ledger. As a result, Pacific Coast utilities have a group of home service women who are extremely sales minded. They have given their energy, time, and thought to developing programs which have resulted in very gratifying returns from the sales angle, and they have just started. The next few years will see many departments asking for the co-operation of sales-minded home service women to interpret the woman's angle in advertising, to assist in training salesmen by actual demonstrations, to assist in research, to help plan and design school laboratories, to design modern gas equipped kitchens, to contact home economics teachers and keep them informed on the latest developments in gas appliances, to contact women writers on magazines and newspapers and see that gas appliances get the right kind of publicity. In fact, there are so many fields that the possibilities are overwhelming.

What specifically are these 13 home service departments of the Pacific Coast doing? It seems that they are up to a great variety of things depending upon the geographical location of their companies and the sales problems. The companies having electric competition, either private or municipal, are the ones who must be constantly on their toes, and the Seattle Gas Co. not only has a versatile president, but a champion home service director.

Beatrice Strege has, in the past four years, served 10,000 Seattle club women the best gas cooked luncheon they ever ate, in addition to giving them a sales talk on the superiority of gas appliances. All this is done in the company building. Her paper on this particular activity won honorable mention at the last P.C.G.A. convention and should be read by utility executives who have a public relations as well as a competitive sales problem.

Miss Strege has also made 20 actual tests, proving the superiority of gas for cooking, and the advertising of the company is being built around these tests, which cannot help but convince a housewife. One of Miss Strege's most unusual activities is her "proof session," when salesmen are invited to bring their "tough" customers to the home service department. Here, before their very eyes, the food is prepared and the "tough" ones allowed to sample. Salesmen report a remarkably high record of sales from these customers.

Some few years ago, newspaper cooking schools were sponsored and managed by advertising agencies for the promotion of nationally advertised foods. In those days gas and gas appliances received very casual mention, if any, and the majority of the women probably attended for the prizes. In 1934, Southern California utilities began assuming responsibility for newspaper schools conducted by their own home economists and supported by local gas appliance dealers. The growth of this enterprise is astounding and the organization which has been built gives the utility entire control of programs.

After a series of highly successful utility-daily newspaper cooking schools conducted by Margaret Lackland, Southern Counties Gas Co. scheduled

(Continued on Page 42)

USING DRY GAS IN MULTIPLE

THE term dry gas is used to differentiate between liquid fuel, such as gasoline, and manufactured gas, natural gas or the gas obtained from various mixtures of liquefied petroleum gas when used as fuel for internal combustion engines.

There is nothing new in the use of gas as fuel for internal combustion engines, as such usage dates back approximately 50 years. What is new, however, is the use of dry gas as fuel in engines which were designed to use a liquid fuel such as gasoline.

Our source of information for the prepared data, the statements and the conclusions herein is the company's laboratory equipment and its experience with thousands of multiple cylinder power units fueled by gas and with the many hundred tractors, trucks, buses and power units operated on various butane-propane mixtures.

The rapid development in the use of the multiple cylinder engines as power units for a wide variety of service and the probable demand for them to use manufactured gas, natural gas or the gas from liquefied petroleum gas, indicated to our company several years ago that this development would create a demand for a specialized type of carburetor apparatus. The company now supplies approximately 90 per cent of the national requirements for such equipment.

In working out the problems of this specialized type of carburetion apparatus, it has naturally been necessary for us to deal with the various types of engines as we have found them. It is the purpose of this paper to show comparative results from the use of dry gas in engines of varying form; to bring out that those excellent characteristics for ideal and economical performance on gasoline which have been built into motors may impair the opportunity for equal performance when the engine is used on dry gas fuel.

It is realized that the relation of the number of engines used for power units is small in comparison with those sold for general automotive service and that the price and availability of power units has benefitted greatly from the general automotive development. We believe it is a fact that most heavy duty type automotive engines may, with minor and relatively inexpensive modifications and changes, be converted by their manufacturer to serve as excellent power units.

Before presenting our laboratory data, which show performance characteristics, we will enumerate several items which we will class as operating variables. These will be treated separately and in the following sequence: (A) Intake Manifold. (B) Compression Ratio. (C) Ignition System. (D) Cooling System. (E) Lubrication. (F) Fuel Supply. (G) Carburetion.

These operating variables as enumerated above have in our opinion a considerable bearing on the satisfactory usage of power units and the growth of *the use of dry gas as fuel for multiple cylinder internal combustion engines.* When each of the operating variables has been covered, a paragraph will be added on the subject of selecting a power unit.

Intake Manifold:

We find that the intake manifold is a major operating variable especially

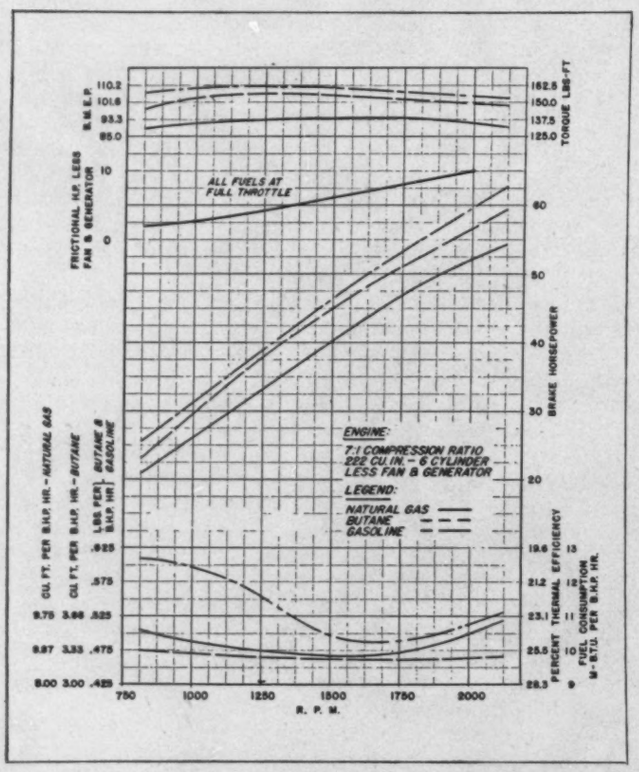


FIG. 1. Comparative Performance Characteristics of Different Fuels at Full Throttle with a Maximum Power Mixture and Hot Manifold.

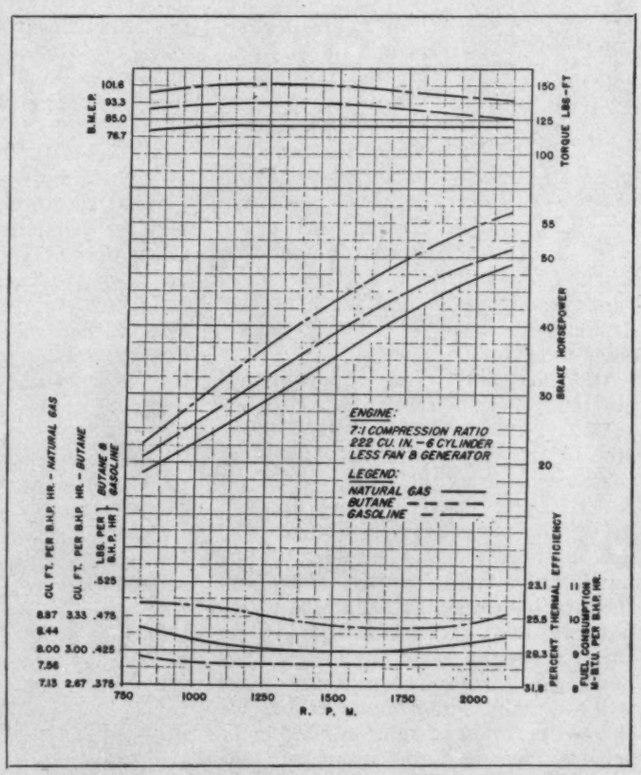


FIG. 2. Comparative Performance Characteristics of Different Fuels at Full Throttle with a Maximum Economy Mixture and Hot Manifold.

CYLINDER ENGINES

By GILBERT WOODILL and KARL WESTLUND*

GILBERT WOODILL

KARL WESTLUND

as regards its type, area and temperature. In the event a power unit is to be equipped with a combination dry gas and gasoline carburetor, a manifold compromise may be necessary. Such compromise should be in favor of the type of fuel which will have the most use. Intake manifolds have been, and should be, designed with a heat control valve which may be set so as to eliminate excessive intake manifold temperature when dry gas is used. Our experience indicates that intake manifold areas are often too small and that too much heat is applied to them especially when dry gas only is used and when maximum motor output may be required as is the case with many intermittent duty installations. With dry gas and because of the fact that it is used in the engine as a true gas, uniform distribution to all cylinders is obtained and uniform volume of charge will result unless flow is affected by manifold temperature or by its area.

Compression Ratio:

Due to the factors involved it is obviously not possible to establish a yard stick that may be used as a guide in choosing the most suitable compression ratio. This is due to the difference in combustion chamber design, engine bore, engine speed, type of fuel to be used and to the ignition system and means of starting the engine. As the octane number of dry gas is much higher than the best grade of gasoline, with ethyl fluid added, compression ratio may be much higher in motors which are to use dry gas exclusively. If combination dry gas and gasoline carburetors are to be used a compromise of compression ratio is necessary, especially with large bore motors. It is our opinion that the performance and power output of some motors, using dry gas exclusively, may be improved by a change in the design of combustion chamber and/or the location of the spark plug.

Ignition System:

There are many advocates of the theory that spark setting should be advanced when compression ratio is raised and dry gas fuel used. We do not subscribe to this theory. Ignition timing is an operating variable and compression ratio, combustion chamber design and spark plug location contribute to the condition. It is obvious therefore that no definite setting may be selected as correct in all cases for maximum power output. As compression ratio is increased, the load on the ignition system is multiplied greatly. It is necessary therefore to maintain such equipment in the best of condition or to supply apparatus that will meet the increased demand. A choice of the proper model of spark plug is, we believe, of more importance than the consideration which is usually given to it.

Cooling System:

It may be said that the cooling system of power units which use dry gas as fuel is one of the most involved of the operating variables. The reasons for this are the wide range of service, varied climatic conditions and the conditions which surround individual installations such as "out in the open" or "in closed or partially closed" buildings. Our experience clearly indicates the necessity for dependable means, built into the unit, to by-pass the cooling water and to control its temperature. It is obvious that a power unit, set out in the field, whose water cooling system is adequate to cool it at 120° atmospheric temperature, with a hot dry wind blowing, will run too cold when a cold damp wind is blowing, with 20° atmospheric temperature, unless such unit is equipped with a suitable means of water temperature control. Proper operating efficiencies may not be obtained with motors which are operated with the water in the cooling system below 160°. Low operating temperatures contribute to increased wear, especially of the piston rings, to blowing by the rings, to crank case condensation and to crank case oil sludging. There are many types of power unit installations where operating efficiencies may be increased by the elimination of the cooling fan load by the installation of a suitable closed system cooling tower.

Lubrication:

As dilution of oil in the crank case is entirely eliminated and very little carbon formed, when dry gas is used as fuel, proper lubrication of multiple cylinder power units should be simplified by the selection of the proper grade of oil. Experience with many installations indicates that this is not necessarily the case, so we class lubrications as one of the operating variables. Lubrication is an operating variable due in part to the difference in operating temperatures of motors, to the difference in atmospheric temperatures and/or climatic changes. Oil in the crank case usually thickens when dry gas is used as fuel, and, as one of the products of combustion of such fuel is moisture, the per cent of moisture being influenced by the hydrogen content of the gas, a poor

* Mr. Woodill is the sales manager and Mr. Westlund is the assistant chief engineer of the Ensign Carburetor Co., Ltd., Los Angeles, Calif.

Notes On Figs. 1 and 2

The curves shown as Figs. 1 and 2 indicate certain relations, all of which are a function of r.p.m. at full throttle. In Fig. 1, values are based on the most economical mixtures that will develop maximum B.hp., while in Fig. 2, values are based on maximum economy mixtures at full throttle. The maximum economy mixture is obtained by successively diminishing the fuel supply in steps below maximum power with subsequent economy calculations at each step. The lowest calculated fuel consumption in terms of pounds of cubic feet of fuel per B.hp. hr. is the value sought. It will be noted in comparing Figs. 1 and 2 that greater economy is obtained with a maximum economy mixture (Fig. 2) at the expense of a loss in B.hp. Upon comparing Figs. 1 and 2, it is found that for gasoline, maximum economy occurs at an average of 93 per cent maximum power; for butane, 88 per cent; and for natural gas 89 per cent. Even in instances where load conditions would permit a mixture adjustment for maximum economy at full throttle, it is not recommended operating below 95 per cent of maximum power because of the excess oxygen in the exhaust which contributes to burning of the valves.

fit of piston rings and resultant blow-by permits such moisture to condense in the crank case, especially if the motor is operated at too low a temperature, thereby mixing with, emulsifying and further thickening the oil which contributes to a condition that is commonly called "oil sludging." It is our experience that marine type engine bases contribute to oil sludging. Such bases have a lower operating temperature, especially when used on "out of doors" installations.

Fuel Supply:

Fuel supply is an operating variable with regard to the cleanliness and dryness of the gas, the pressure of gas and the length and size of the supply line. There is a difference in gas in various districts, as to whether it is manufactured, enriched or natural gas and to its B.t.u. value. Experience indicates that many so called carburetor complaints come from dirty fuel and scaley lines, from improper size and type of connections and from varying pressures. It is

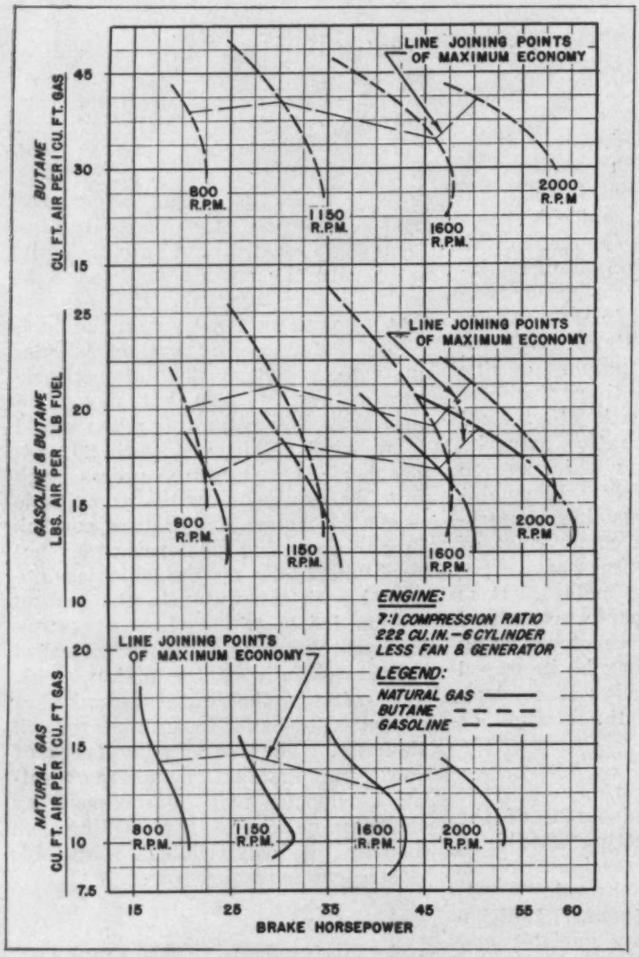


FIG. 3. Comparative Air Fuel Ratios at Full Throttle, Hot Manifold, from Rich to Leanest Combustible Mixture.

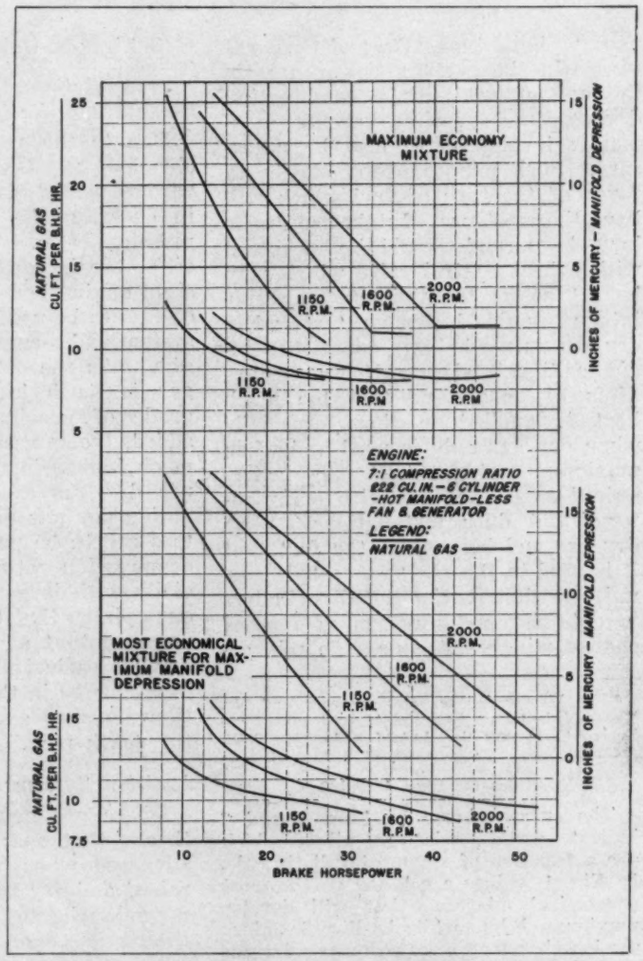


FIG. 4. Partial Throttle Economies and Manifold Depression from Full Load to One-Quarter Load at Different r.p.m.'s.

NOTES ON FIG. 3

A comparison of air fuel ratios as a function of B.hp. for different fuels, is shown on Fig. 3. Butane and natural gas are shown on a basis of cubic feet of air per one cubic foot of gas. Gasoline and butane are shown on a basis of lbs. of air per lb. of fuel. Mixture ratios on each fuel are expressed at four full throttle speeds. Values for curves at such speed are determined by observing the change in B.hp. and air fuel ratio with successive steps of diminishing the fuel supply at constant engine speed. Each curve represents values obtained by starting at a rich or maximum power mixture and running to the leanest mixture that will fire without missing. The length of each curve from the point of maximum B.hp. to the end at minimum B.hp. gives an indication of the ability to lean the mixture at that speed. Points of maximum economy on each group of curves joined by lines are based on fuel consumption per B.hp. hr., showing relative position on each curve with respect to maximum power and the leanest mixture that will burn at that r.p.m.

NOTES ON FIG. 4

In Fig. 4 are shown partial throttle curves on natural gas at different speeds from full load to 25 per cent with the corresponding manifold depressions. A comparison between partial throttle fuel consumption at the different speeds, indicates the increased economy obtained at the lower speeds. Manifold depressions taken with the most economical mixture for maximum manifold depression are practically straight lines from maximum to 25 per cent load, and for this particular engine are a close indication of the B.hp. or B.M.E.P. Attention is directed to the lines for manifold depression at maximum economy for 1600 and 2000 r.p.m. It is interesting to note that in these two instances the same manifold depression exists at ¾ load as at full load, or in other words with natural gas, and butane as well, it is possible to lean the mixture to the point that makes it necessary to fully open the throttle to maintain that load.

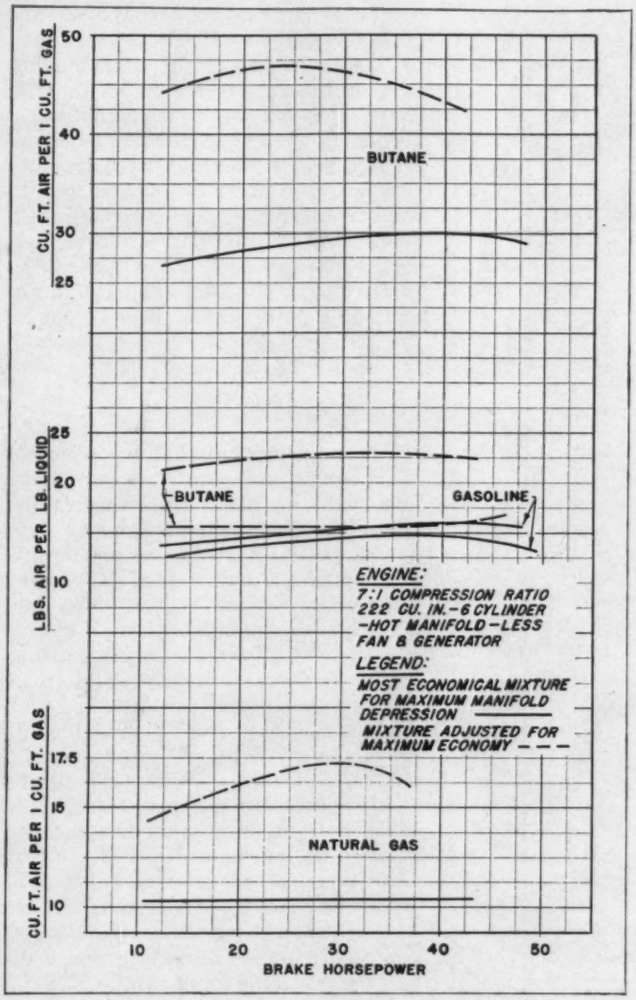


FIG. 5. Air Fuel Ratios from Full Load to 25 per cent Load at 1600 r.p.m.

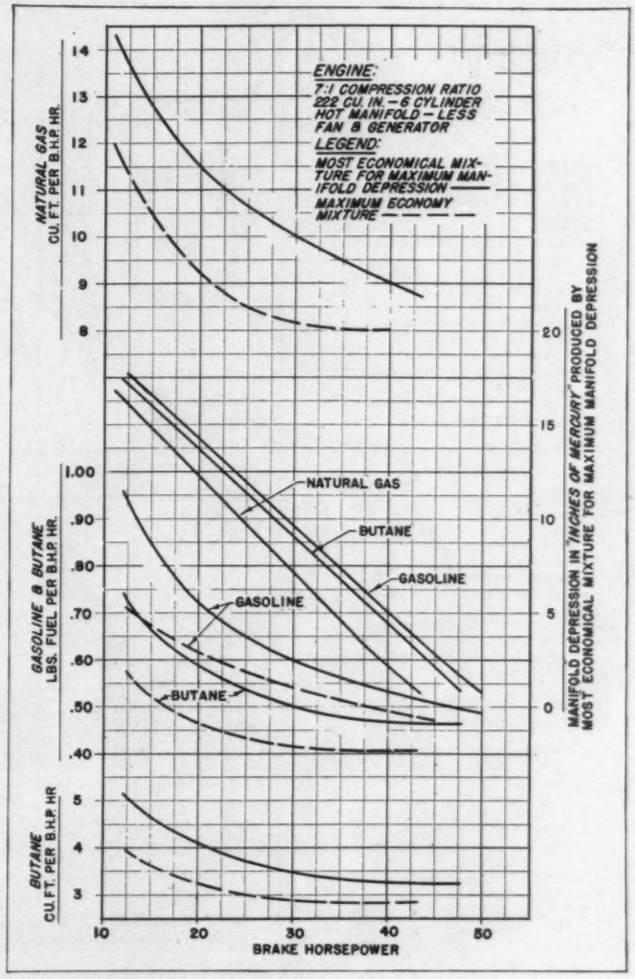


FIG. 6. Partial Throttle Economies from Full Load to One-Quarter Load.

NOTES ON FIG. 5

In Fig. 5 is shown the comparative air fuel ratios as a function of B.hp. for butane and natural gas in cubic foot of air per one cubic foot of gas and for butane and gasoline in pounds of air per pounds of fuel at 1600 r.p.m. partial throttle. It is interesting to note in the comparison of butane and gasoline the wide variance in the change in air fuel ratio from a mixture that will give maximum manifold suction to a mixture of maximum economy. This condition is apparently due to the different combustion characteristics between a liquid and gaseous fuel. Comparing butane and natural gas, the maximum increase in air fuel ratio for the same mixture changes in both cases, is 65 per cent. This indicates that both gaseous fuels of widely different density have equal combustion ability in an excess of air. The portion of the maximum economy mixture ratio between 75 per cent and full load should theoretically be a straight line since the throttle was wide open at both points, but due to the experimental error in accurately determining the maximum economy mixture ratio and an apparent engine characteristic, this portion of these curves deviates from the theoretical.

NOTES ON FIG. 6

Fig. 6 illustrates the difference in partial throttle economies between the most economical mixture for maximum manifold depressions and a maximum economy mixture on natural gas, butane and gasoline as a function of B.hp. at 1600 r.p.m. The manifold depressions for the most economical mixture for the maximum manifold depression are shown for the three fuels as a function of B.hp. There has been some attempt to use the manifold depression as a yardstick for determining B.hp. on stationary engine installations. We want to point out the necessity of certain considerations in this matter, as there is a wide variance in manifold depressions for different fuels, which indicates in general that the more concentrated the fuel, the higher the manifold depression for a given load. Gasoline produces the highest depression because it is a liquid which can be relied upon as being constant, while on the other hand a low value gas such as 500 B.t.u., which, also of a definite composition, would be constant, would represent the opposite extreme. There are other variables to be considered in reference to manifold depression-load relations, such as frictional hp. valve and piston ring leakage, barometric pressure and altitude, fan load and other minor variables.

our opinion that fuel supply lines and connections should be based upon an engine demand of 15 cu. ft., (1100 B.t.u. gas) per brake horsepower hour with a receptacle close to the engine, which will supply gas for sudden engine demands without any appreciable drop in pressure. We have seen many instances where engine failed in power and speed due to too small supply lines and/or low pressure which caused engine to suck on the line in an endeavor to get adequate fuel supply.

Carburetion:

Carburetion equipment is an operating variable due in part to the other

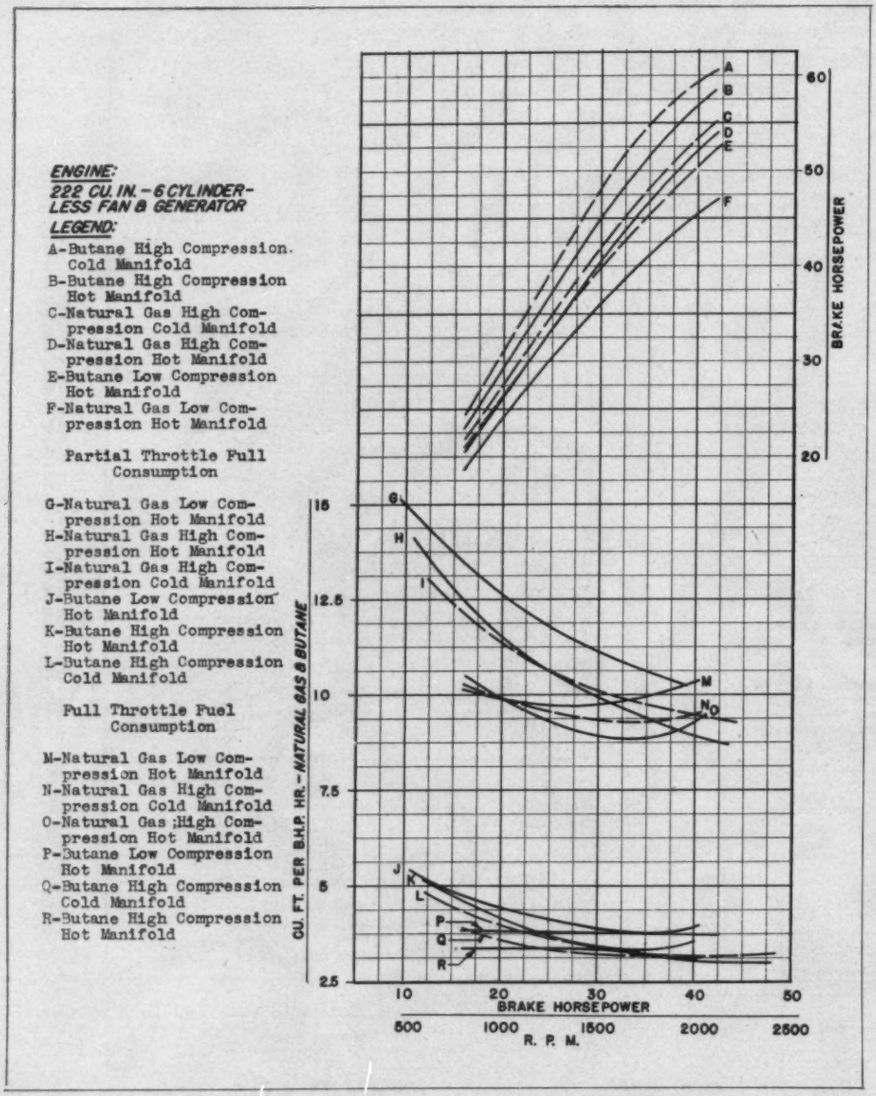

ENGINE:
222 CU. IN. - 6 CYLINDER - LESS FAN & GENERATOR
LEGEND:
A-Butane High Compression. Cold Manifold
B-Butane High Compression Hot Manifold
C-Natural Gas High Compression Cold Manifold
D-Natural Gas High Compression Hot Manifold
E-Butane Low Compression Hot Manifold
F-Natural Gas Low Compression Hot Manifold
Partial Throttle Full Consumption
G-Natural Gas Low Compression Hot Manifold
H-Natural Gas High Compression Hot Manifold
I-Natural Gas High Compression Cold Manifold
J-Butane Low Compression Hot Manifold
K-Butane High Compression Hot Manifold
L-Butane High Compression Cold Manifold
Pull Throttle Fuel Consumption
M-Natural Gas Low Compression Hot Manifold
N-Natural Gas High Compression Cold Manifold
O-Natural Gas High Compression Hot Manifold
P-Butane Low Compression Hot Manifold
Q-Butane High Compression Cold Manifold
R-Butane High Compression Hot Manifold
CU. FT. PER B.H.P. HR. - NATURAL GAS & BUTANE
BRAKE HORSEPOWER
R. P. M.

FIG. 7. Brake Horsepower and Fuel Consumption on High Compression and Low Compression with Hot and Cold Manifolds.

NOTES ON FIG. 7

In Fig. 7 is shown B.hp. and fuel consumption comparison on natural gas and butane for high compression (HC) with hot and cold manifolds, and low compression (LC) with hot manifold. B.hp. values are shown as a function of r.p.m. at full throttle, while fuel consumption values are shown at partial throttle as a function of B.hp. at 1600 r.p.m. The mixtures for the curves on this figure are most economical for maximum B.hp. at full throttle and maximum economy for maximum manifold depression for partial throttle. It is interesting to note the considerable variance in partial throttle economy between HC and LC with hot manifold and also the small variance between hot and cold manifold for HC. The manifold on this engine is of larger cross-sectional area per displacement than the average and has sufficient heat to give good performance on gasoline.

operating variables which have been previously listed and separately treated. As the value of gas may vary in different locations from 550 to 1150 B.t.u. and may change from the former to the latter by the connection of the distributing system to interstate natural gas lines or change from time to time by enrichment or by dilution with air, thereby changing its composition, it is evident that carburetion equipment is required which will meet such conditions when its adjustments are changed. Our company has a full line of gas and combination gas and gasoline carburetors and equipment which has been designed with such conditions in mind. Its products are manufactured to meet these and such other variables as are brought about by supplying equipment for engines from 2½ hp. single cylinder on up to 4-, 6-, 8-, and 12-cylinder motors which develop 500 hp. or less. Ensign carburetors are of the venturi type, the venturi may be readily changed, the only moving part of the carburetor is its throttle shaft. Ensign gas fuel regulators, a necessary part of each carburetor assembly, are of the differential pressure type which control the flow of gas to the carburetor, at a pressure slightly below that of atmosphere, thereby assuring proper metering of gas at the carburetor. The fuel regulator automatically shuts off the flow of gas to the carburetor when the demand from the engine has ceased.

Selecting a Power Unit:

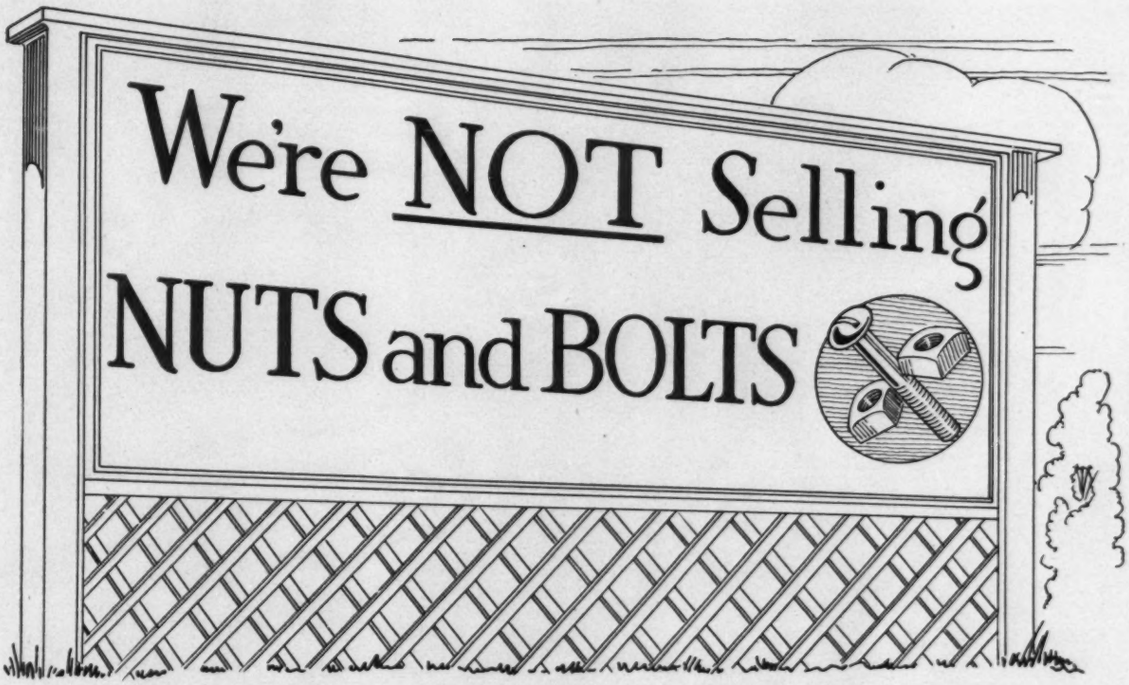
We are convinced that the selection of a power unit could be simplified and could be made more accurately, if the power unit manufacturer published partial throttle curves on his various units, using 1100 B.t.u. dry gas as fuel. Such curves to be furnished at three different, well selected speeds for each unit. As intake manifold depression bears a distinct relation to developed power, such partial throttle curves should include the manifold depressions at each 25 per cent of load. With such curves in his possession the service mechanic could determine in a rather definite manner the power unit load. As certain manufacturers would use 550 B.t.u. manufactured gas enriched to 1100 B.t.u. by butane-propane gases and others butane-propane gases diluted by air to 1100 B.t.u., for such data, the figures should be corrected to the use of 1100 B.t.u. natural gas.

As a multiple cylinder power unit, used for oil well pumping, may be expected to furnish continuous uninterrupted power day and night, which when converted into miles of vehicle operation, means in hours an annual usage in excess of 150,000 miles, it should be evident that sturdy quality of unit and accessories is of paramount importance. We have observed multiple cylinder power units, using 1100 B.t.u. natural gas, which have delivered a continuous power output, uninterrupted by breakdown or repair, for over 1,000,000 hours. The selection of the proper power unit and its accessories are, we believe, the answer to the successful usage of multiple cylinder power units which use dry gas as fuel.

In connection with the curves and data we have prepared, the following important information is presented.

All laboratory data were accurately taken and reduced to standard conditions (29.92 In. Hg. and 60°F.).

(Article continued on Page 38. Figs. and Fig. notes continued on Page 36.)



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In advertising and sales promotion material supplied by ROPER for your use, mechanical features are held in the background. Stress is given to what those features offer in terms of savings, finer foods and more leisure.

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- GIANT HIGH-SPEED BURNER
- "LOW TEMPERATURE" OVEN BURNER
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WAREHOUSES:

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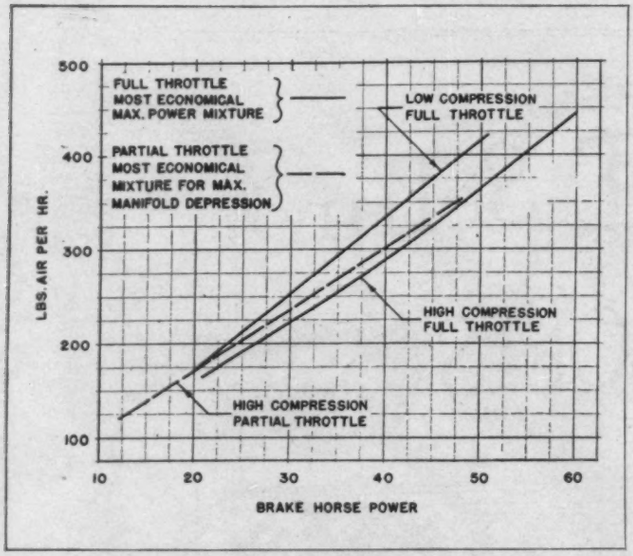


FIG. 8. Brake Horsepower Air Ratio for 222 cu. in. 6-Cylinder Engine, Less Fan and Generator.

NOTES ON FIG. 8

Fig. 8 indicates B.hp. air ratio for HC hot manifold for full throttle loads and partial throttle loads and LC hot manifold for full throttle. For each compression ratio all fuels require the same air per B.hp. The maximum B.hp. of natural gas at 2000 r.p.m. HC hot manifold is 53, while the maximum for gasoline is 60. The difference in air requirements in cubic feet for these two fuels to develop the mentioned B.hp. is equivalent to the volume of gas making up the mixture, which is naturally excluding the air. The same relation exists for different loads over the range of the curves. The low compression ratios require more air to produce the same B.hp. because of the lower thermal efficiency. It is also found that for a given r.p.m. full throttle, the low compression ratio uses more air. This is because the volumetric efficiency increases with a decrease in compression ratio. Air fuel ratios for partial throttle operation are not given for the low compression ratio because they are substantially the same as for high compression. It has been found that it is not possible with low compression ratios to operate to the extremely high air fuel ratios as with high compression. The mixture ratios for normal operation are, however, substantially the same.

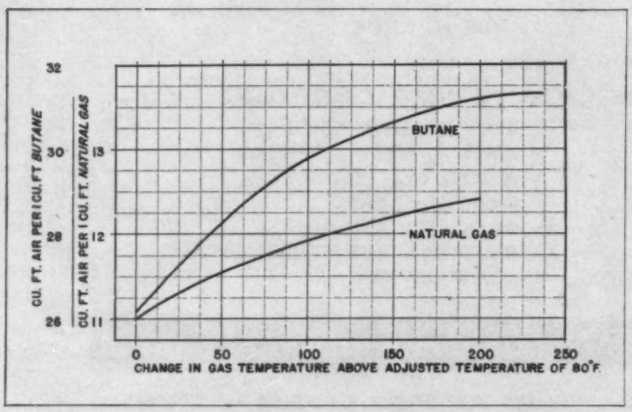

CU. FT. AIR PER I CU. FT. BUTANE
CU. FT. AIR PER I CU. FT. NATURAL GAS
BUTANE
NATURAL GAS
CHANGE IN GAS TEMPERATURE ABOVE ADJUSTED TEMPERATURE OF 80°F.

FIG. 10. Change in Mixture Ratio with Change in Temperature of Gas Fuel Supply at Carburetor.

NOTES ON FIG. 10

The curves shown in Fig. 10 indicate a condition that arises when carburetors are adjusted with fuel at temperatures far below that of continuous operating conditions. The two curves indicate the change in mixture ratio for up to 200° F. change in fuel temperature supply to the carburetor, with adjustment remaining constant. If mixtures are adjusted for near maximum economy and a substantial rise in fuel temperature occurs, unsatisfactory operation may occur. The information as supplied is a result of flow characteristics being affected by change in fuel density. On installations requiring complete vaporization of liquid fuel, this danger is most acute because of the inability of most vaporizing devices to maintain a constant outlet fuel temperature. This condition mentioned accounts for unsatisfactory operation occuring between the starting and warm-up period on some installations.

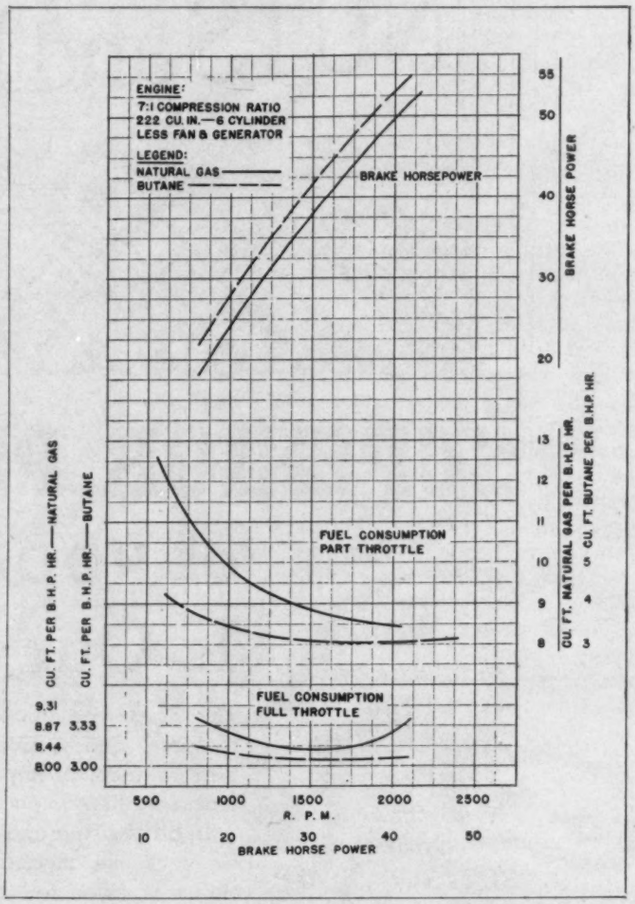
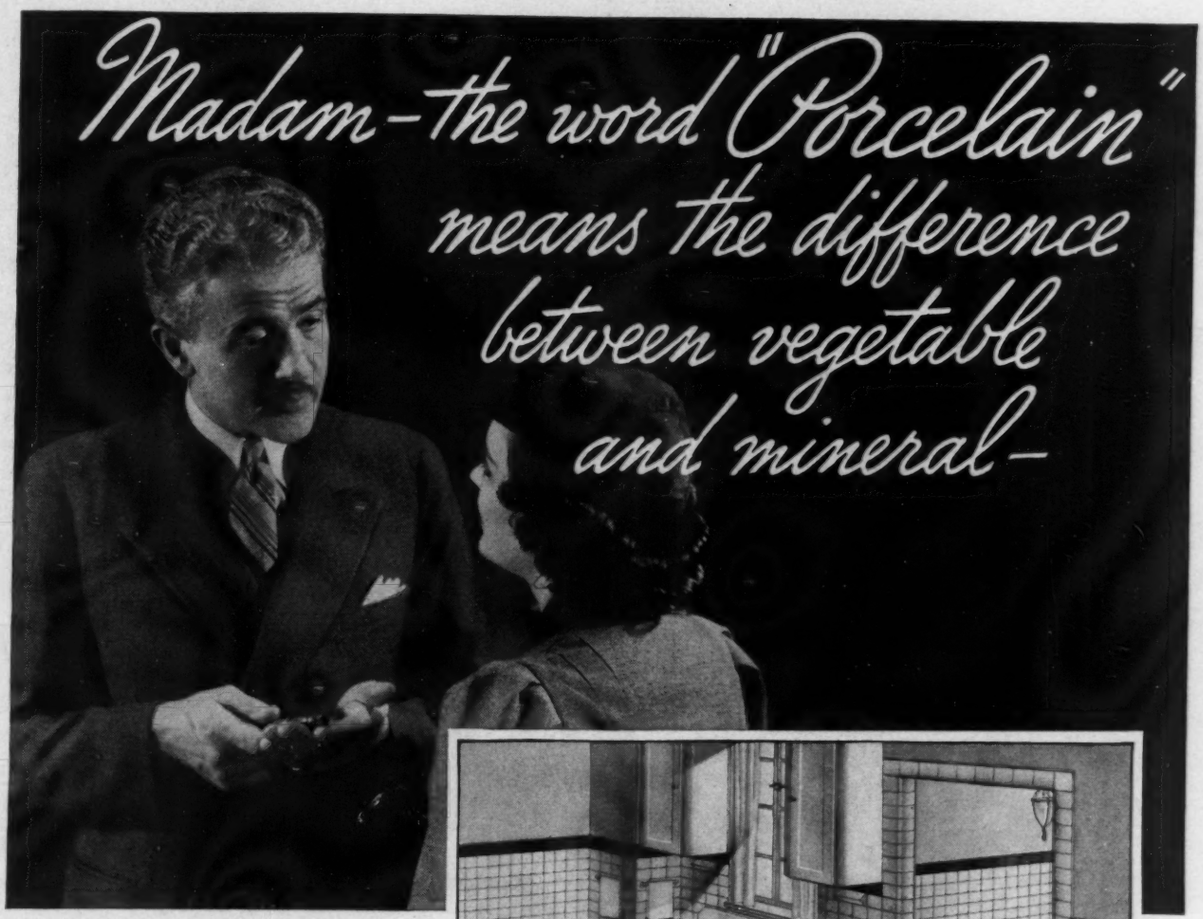


FIG. 9. Ideal Curves Based on Recommended Mixtures.

NOTES ON FIG. 9

Fig. 9 shows ideal partial throttle fuel consumption as a function of B.hp. at 1600 r.p.m., and full throttle fuel consumption curves as a function of r.p.m. for the test engine referred to. The B.hp. developed with the mixtures used will produce the B.hp. shown which are a function of r.p.m. at full throttle. The full throttle mixture is one that will develop 95 per cent maximum power. The partial throttle mixture midway between a mixture for maximum manifold depression and a mixture for maximum economy is used from full load to 75 per cent full load. The remainder of the partial throttle mixture curve tapers off to about 25 per cent richer than the maximum economy mixture at 25 per cent load. We believe these mixtures will not be detrimental to valves and will produce unusual economies. In instances where continuous power requirements range from a 75 per cent load to maximum power, the described full throttle mixtures are out of the question. Such a condition would result in approximately full throttle operation between 75 per cent and full load, which would prevent proper cylinder lubrication, owing to the reduced manifold suction, and would consequently tend to burn valves as previously described.

(Turn to Page 38)



● "Unfortunately the term 'enamel' is used for a great many finishes. Paints, lacquers, and all sorts of vegetable compounds, some of which are baked on steel at about the same heat you use to bake biscuits.

"But *this* is *porcelain* enamel. And porcelain is a mineral substance—like glass, fired in a furnace having 1550 degree heat.

"And there is no more chance for your *porcelain* enameled appliance becoming scratched, dulled, marred, or losing its lustre than with your plate glass mirror. Porcelain enamel is flint hard. It is as non-absorbent as a glass tumbler; as sanitary as a clean saucer—all with the strength of steel. It is absolutely fadeless; its beauty everlasting.

"Porcelain enamel is the sterling quality finish. It always gives you two things: a lifetime of service, and a lifetime of pride and satisfaction."

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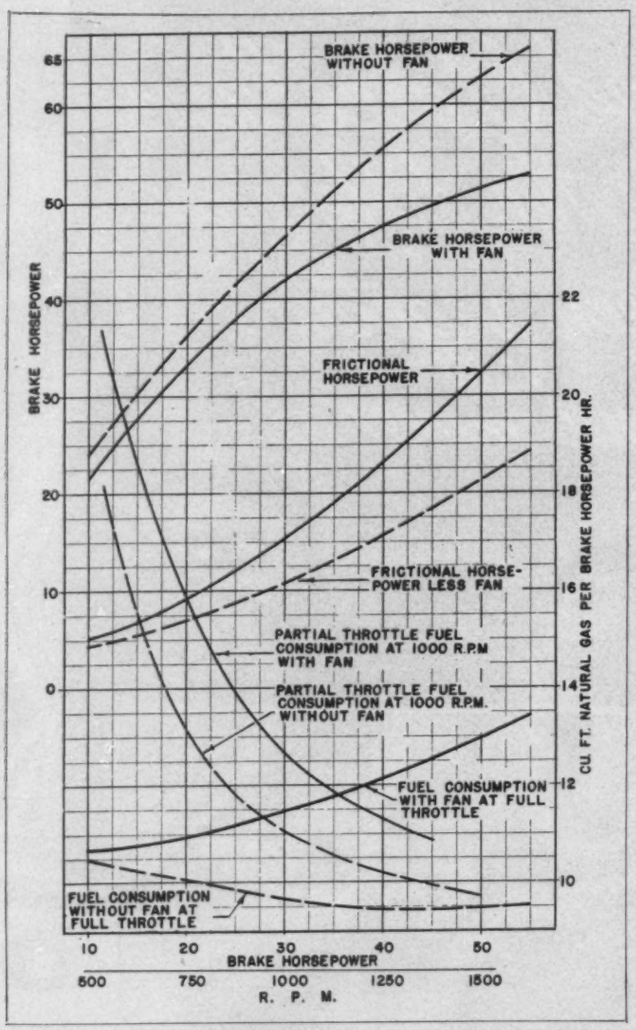
BRAKE HORSEPOWER WITHOUT FAN
BRAKE HORSEPOWER WITH FAN
FRICTIONAL HORSEPOWER
FRICTIONAL HORSE-POWER LESS FAN
PARTIAL THROTTLE FUEL CONSUMPTION AT 1000 R.P.M WITH FAN
PARTIAL THROTTLE FUEL CONSUMPTION AT 1000 R.P.M. WITHOUT FAN
FUEL CONSUMPTION WITH FAN AT FULL THROTTLE
FUEL CONSUMPTION WITHOUT FAN AT FULL THROTTLE
BRAKE HORSEPOWER
CU. FT. NATURAL GAS PER BRAKE HORSEPOWER HR.
R. P. M.
500
750
1000
1250
1500

FIG. 11

Effect of Fan Load on Brake Horsepower and Fuel Consumption.

NOTES ON FIG. 11

Fig. 11 represents data taken from a popular heavy duty industrial power unit. The outstanding effect of a large fan on fuel consumption is shown for both full throttle and partial throttle operation. In this instance if 30 B.hp. is desired, operation with a fan is approximately at 66 per cent load factor while, without fan, the load factor is 60 per cent. Even with the lower load factor without fan, the saving in gas is 45 cu. ft. per hour. We believe in some instances the economical approach is in favor of a suitable closed cooling tower instead of a fan and radiator.

Natural gas as referred to hereafter is of the following composition and has a heat content of 1125 B.t.u. per cu. ft. Composition: Methane, 81.4 per cent; Ethane, 16.7 per cent; Nitrogen, 1.6 per cent; CO_2, 0.3 per cent; Octane rating, 100 plus.

Butane as referred to hereafter is of the following composition, and calculations involving this fuel are based on values taken from the *Handbook of Butane-Propane Gases*, published by G A S, (Formerly *Western Gas*). Composition: Ethane, 0.4 per cent; Butane, 66.1 per cent; Propane, 33.0 per cent; Iso-Pentane, 0.5 per cent; Octane rating, 108 plus:

Gasoline as referred to hereafter is of the following specifications: Ethyl Gasoline 61-A.P.I.; 21,000 B.t.u. per gal.; Octane rating, 81.

The curves shown comparing fuel consumption of gasoline and butane are based on a gasoline of .735 specific gravity and butane of .558 specific gravity. At no time was there detonation when operating on this gasoline, which is mentioned to eliminate doubt as to the basis of comparing gasoline with the other fuels with the high compression ratio.

In treating this subject we are giving as much information as space will permit and are confining most of the data to a typical 6-cylinder engine in an effort to give the complete picture. General major factors are also demonstrated on other types of engines. To be consistent with general recommendation and past experience on this engine, cold spark plugs were used with .020 gap for all tests. The spark was manually adjusted in all cases for best results.

As economy of operation is the basis for utilization of dry fuels, this phase of the problem will be given major consideration.

In order to compare the different fuels on the same basis, reference is made to the following mixture conditions which are repeatedly referred to on curves and are as follows:

1. The "most economical mixture for maximum power" at full throttle which is the optimum condition for maximum power operation.

2. The "maximum economy mixture, at full throttle" occurs at a loss of as much as 15 per cent of full throttle maximum B.hp. and is purely an experimental basis of comparison.

3. The "maximum economy mixture for maximum manifold depression" is easily obtained with the use of a manifold vacuum gage when adjusting for partial throttle operation. It is our belief that most mixture adjustments favor the rich side of this mixture which is uneconomical.

4. "Maximum economy adjustment for partial throttle" occurs at a lower manifold depression (nearer atmosphere, than that referred to in (3) and is purely an experimental basis of comparison.

In this discussion are shown ideal curves, and recommendations are made as to the proper mixture adjustment for economical operation. Procedure for adjusting for economical operation is also given.

It may occur to some readers that part of the information in this paper is irrelevent insofar as utilization of dry fuels in internal combustion engines is concerned. The object in directing attention to some of the dry fuel characteristics which are different from those of gasoline in present day engines is to encourage possible improvement in the types of engines now used with dry fuels.

The curves referred to as Figs. 1 to 9 inclusive, are obtained from a 6-cylinder 222-cu. inch moderate speed engine without fan or generator. We are presenting this engine in this manner to conform to a general practice of many engine manufacturers. The data obtained on this engine or the other are in no way phenomenal since mechanical condition was not above average. The high compression 7:1 head on this engine had 160 lbs. gage pressure at 650 r.p.m., while the low compression 5:1 head had 100 lbs. gage. We are presenting partial throttle engine performance curves which the user is most interested in, as it is in this range that most engines operate the majority of their life and are at 1600 r.p.m.

Exhaust Gas Temperature and Intake Manifold Temperature

In accumulating data for the curves in Fig. 1, exhaust gas temperatures were taken with thermocouples in each exhaust port about one inch from the block. The exhaust gas temperatures were found to be the same on all three fuels at the same

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Here, in this newest and finest addition to the Pacific line of gas heating equipment, is the answer to competition from other fuels in the better homes.

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The smooth casing of this unit is furnished in a choice of several attractive colors which will harmonize with decorative schemes where basements are used as recreation rooms. Gleaming chromium trim sets off sides and corners. All controls are completely enclosed for added safety.

The Pacific Streamline De Luxe Blower Furnace is completely automatic in operation. In winter, room thermostats hold the supply of warmed and filtered air at exactly the right temperature. In summer the blowers ventilate thoroughly and furnish an appreciable amount of cooling.

The Pacific Streamline De Luxe Forced-Air Unit will have its premier showing at the A. G. A. Convention in Kansas City, May 9th to 14th. Be sure to see this and many other Pacific heating appliances on display.

If you are not attending the Convention, write at once for new sales literature now in preparation. Take our word for it that the Pacific Streamline De Luxe Blower Furnace will outperform and outsell any other gas fired unit in the quality field.

PACIFIC GAS RADIATOR COMPANY

1740 WEST WASHINGTON BLVD., LOS ANGELES, CALIFORNIA

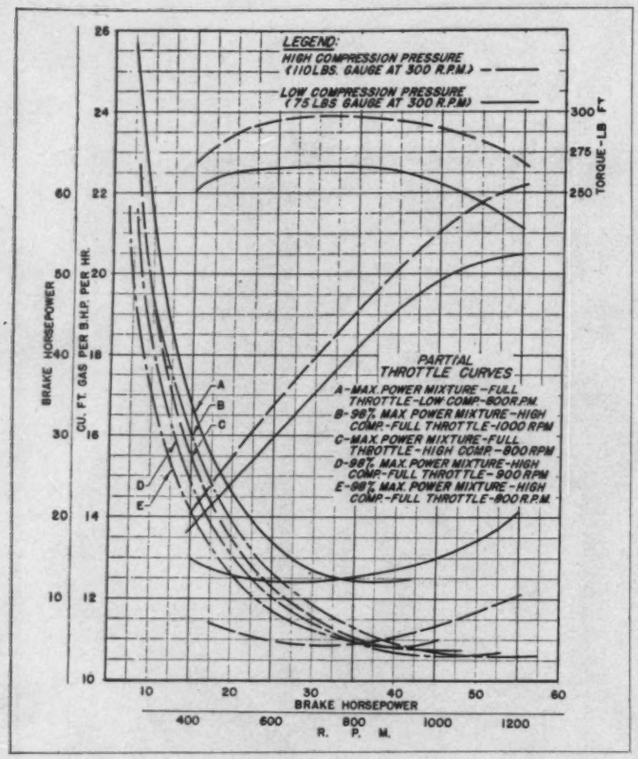
LEGEND:
HIGH COMPRESSION PRESSURE (110 LBS. GAUGE AT 300 R.P.M.)
LOW COMPRESSION PRESSURE (75 LBS. GAUGE AT 300 R.P.M.)
PARTIAL THROTTLE CURVES
A-MAX. POWER MIXTURE-FULL THROTTLE-LOW COMP.-800 R.P.M.
B-98% MAX. POWER MIXTURE-HIGH COMP.-FULL THROTTLE-1000 R.P.M.
C-MAX. POWER MIXTURE-FULL THROTTLE-HIGH COMP.-800 R.P.M.
D-98% MAX. POWER MIXTURE-HIGH COMP.-FULL THROTTLE-800 R.P.M.
E-98% MAX. POWER MIXTURE-HIGH COMP.-FULL THROTTLE-600 R.P.M.
BRAKE HORSEPOWER
CU. FT. GAS PER B.H.P. PER HR.
TORQUE-LB FT
BRAKE HORSEPOWER
R. P. M.

Fig. 12. Comparative Performance Characteristics on a Heavy Duty, Four-Cylinder, Slow Speed Engine with Hot Manifold.

NOTES ON FIG. 12

In Fig. 12 comparison is made on a slow speed heavy duty type engine between two compression ratios. B. hp., torque and full throttle fuel consumption are given as a function of r.p.m. at full throttle and maximum power mixture. Comparison is also made in the partial throttle economy curves for high compression between a maximum power mixture, full throttle and a 98 per cent maximum power mixture as a function of B.hp. The economy advantage of operating at lower speeds is also shown in these curves.

load conditions. With the HC head and hot manifold at full throttle, 2000 r.p.m., the average exhaust temperatures were about 1240° F, while at 800 r.p.m., the temperatures were about 930° F. For 75 per cent full load at 1600 r.p.m. the temperatures were 1150° F, while at 25 per cent full load at 1600 r.p.m., the exhaust temperatures were about 950° F. With cold intake manifold there was naturally a small drop in the exhaust temperature for all loads.

The hot intake manifold wall temperature and the manifold mixture temperature were taken about three and one inch respectively from the block. At maximum power, 2000 r.p.m., the wall temperature averaged 240°. The butane and natural gas temperature averaged 133° F., and the gasoline mixture temperature averaged 105°. These temperatures were quite consistant over the whole range of operation except wall temperature, which decreased slightly with load to 200° at 800 r.p.m. full throttle.

With the low compression head, the exhaust temperatures were found to be about 100° F. higher than with the high compression head.

The change of mixture has the opposite effect on exhaust gas temperatures from what is generally believed by the layman. Maximum exhaust gas temperature occurs at slightly below maximum power at full throttle, and a change in mixture to maximum economy or maximum richness decreases the exhaust gas temperature by as much as 150°. Mention of this fact is made to disprove the belief that lean mixtures are responsible for burning exhaust valves because of change in exhaust gas temperature. Burning of the valves, as was mentioned before, is accelerated by the excess oxygen in the exhaust with lean mixtures.

Spark Plugs:

In the use of dry fuels it is recommended that colder spark plugs be used than for gasoline. The cooling of spark plug electrodes that occurs during the induction and compression period with gasoline, because of the wet particles of fuel coming in contact with them, is not present with dry fuels. Because of the absence of this phenomenon which on gasoline contributes to the fouling of plugs, it is possible to use a colder plug with dry fuel. The type and temperature of the plug, we believe, can best be determined by experiment, as we know of no fixed rule for determining this. As is general practice, we recommend closer plug gaps for high compression ratios than for lower compression ratios. The higher ignition load at higher compressions necessi-

(Continued on Page 44)

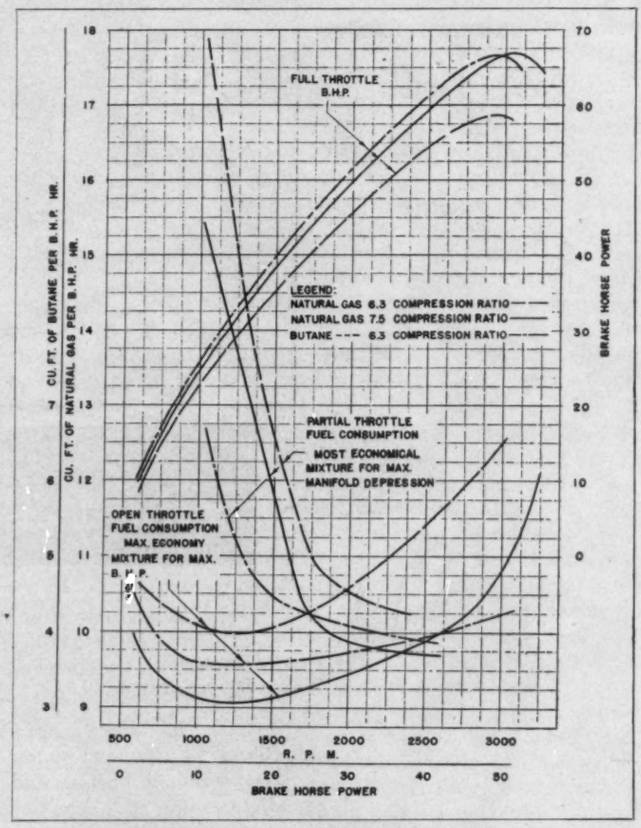
FULL THROTTLE B.H.P.
LEGEND:
NATURAL GAS 6.3 COMPRESSION RATIO
NATURAL GAS 7.5 COMPRESSION RATIO
BUTANE 6.3 COMPRESSION RATIO
PARTIAL THROTTLE FUEL CONSUMPTION
MOST ECONOMICAL MIXTURE FOR MAX. MANIFOLD DEPRESSION
OPEN THROTTLE FUEL CONSUMPTION
MAX. ECONOMY MIXTURE FOR MAX. B. H. P.
CU. FT. OF BUTANE PER B.H.P. HR.
CU. FT. OF NATURAL GAS PER B.H.P. HR.
BRAKE HORSE POWER
R. P. M.
BRAKE HORSE POWER

FIG. 13. Brake Horsepower and Fuel Consumption on Natural Gas and Butane with Fan and Generator—Cold Manifold —Manufacturer's Automatic Spark Control.

NOTES ON FIG. 13

Fig. 13 shows a comparison between butane and natural gas over the complete useful power range on a high speed 8-cylinder engine with fan and generator for two compression ratios with most economical mixtures for maximum power at full throttle. Maximum B.hp. and corresponding fuel consumptions are given as a function of r.p.m. Partial throttle economies are based on a maximum economy mixture for maximum manifold depression and are shown as a function of B. hp. at 1600 r.p.m. The speed of 1600 r.p.m. was chosen in order to show fuel consumption for a speed comparable to that required for 60-cycle generators.

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Model No. 1085-OT . . . Same as 1045 but with Open Top.

- Wedgewood's Automatic Time Control
- Wedgewood's Automatic Oven Temperature Control
- Wedgewood's Automatic Oven Lighting
- Wedgewood's Extra-Low-Temperature Oven that cooks roasts without need of basting, searing, or watching.
- Wedgewood's .Speed-Plus-Simmer .Burners that light automatically.

EVERY WOMAN LONGS FOR CAREFREE HOURS away from the kitchen on these glorious Spring days . . . and when you show women Wedgewood's amazing automatic features and time-saving aids, you point the WAY to that freedom. Better still, you use a selling point that's right in season.

Stress these famous Wedgewood features to your customers NOW . . .

WEDGEWOOD

The Modern Gas Range

Makes Friends for Gas

JAMES GRAHAM MANUFACTURING CO. • San Francisco, Los Angeles, Newark, Portland

Pacific Coast Home Service Progress

(Continued from Page 29)

17 schools to be conducted with weekly newspapers in smaller communities. These are conducted by Lucile Martens. Every gas appliance dealer is urged to co-operate in these schools. The company furnishes a model kitchen background for the stage, equipment and publicity, and the home economist makes every effort to publicize the dealers, mention national advertising such as the Mystery Chef program, "Controlled Cookery," and any current campaign. Each woman checks information about her appliances on her attendance ticket and at the conclusion of the school these are distributed to dealers for prospect information. The Southern California Gas Co. and the Los Angeles Gas and Electric Corp. have conducted a similar program with both daily and weekly newspapers for the past three years. It is interesting to note that these three companies conducted a total of 67 newspaper cooking schools before audiences numbering 142,203 people during 1936. Certainly some of the credit for the unprecedented sale of gas ranges and refrigerators in this territory must be attributed to the wholesale telling of the story of gas. Possibly the best proof of the cooking school's effectiveness is the fact that the dealers are the most enthusiastic boosters and the biggest advertisers.

During 1935, some 500 clock-controlled gas ranges were installed in the home economics kitchens of the Los Angeles city schools, whereupon it became the duty of the home service departments to see that not only the pupils understood using these appliances, but also the teachers. It became customary then that as soon as these ranges were installed a home service representative took over an entire day's classes, explaining and demonstrating to each class the proper way to broil, to use surface burners, to roast meat, to preheat, to set the thermostat, and to bake, as well as how to care for the range. Incidentally, the day following the first use of these ranges, several parents visited the school principal, demanding to know the names of these ranges, since their daughters had insisted that they purchase one for the home.

As a result of the contacts which the home service representatives made with these home economics teachers, the Natural Gas Bureau was asked to develop a program for the annual Los Angeles Teachers Institute. This was an unprecedented opportunity, since a commercial organization had never before been invited to participate. Under the chairmanship of Katherine Rathbone, home service director for Southern Counties Gas Co., Victoria Warner of L. A. Gas and Electric Corp. and Gladys Price of Southern California Gas Co. planned a program which was so well attended that there was standing room only: 350 were expected, 500 were planned for, 700 were seated and 200 were turned away.

The mechanics of the whole set-up was most interesting. The stage was provided with a model kitchen background. Four domestic gas ranges were set up and used. Much food, including a roast turkey, was prepared, displayed and given away as prizes. The program was built around the title of "Foods of 1937, Fads and Facts." This gave an opportunity to refute false competitive claims and appeal to the intelligence of a group whose chief interest was the preparation of food. At the conclusion of the program, tea was served and each teacher was presented with a copy of the gas cookery booklet "Controlled Cooking."

The cafeteria managers of the Los Angeles city schools recently requested a program similar to that given for the home economics teachers. For this occasion, a complete display of commercial ranges was assembled and a chef demonstrated one of the newest insulated commercial bake ovens. The attendance at this affair was 225.

In smaller communities, home service representatives have given most successful demonstrations to entire student bodies. In one instance the boys petitioned the principal to allow them to attend rather than be excused for recreation. This trend may well be viewed with alarm by the male sex. During 1936, home service representatives of Southern California Gas Co. conducted 31 school demonstrations to a total of 1500 future home makers, while the Los Angeles Gas & Electric Corp. conducted 50 classes for 1800 pupils.

When Payne Furnace Co. of Beverly Hills remodeled its factory, the company included an auditorium, stage, and two model kitchens. The auditorium is air conditioned and beautifully equipped with bridge tables, silver, and linens for 80 people. Through a co-operative arrangement, this auditorium is available to the home service department of the Southern California Gas Co. which schedules meetings for women's organizations. The company offers them the use of the auditorium free and the home service woman serves dessert and gives those attending a 30- to 45-minute demonstration of gas ranges and refrigerators. Afterward the women play bridge. This plan gives a women's organization an op-

SOUTHERN CALIFORNIA Gas Service Company's home service group. Front row, left to right: Vira Bardwell, Beth Marker, Grace Juhl, Gladys B. Price, Maurine Boradori, Jessie Ewing, Lucille Hotelling, Helen Brown. Back row, left to right: Ruth Easley, Dorothy Clark, Charlotte Brush.

ONLY ONE OF THE UTILITIES THAT RECOMMEND AGP PRODUCTS—

A STANDARD LINE FOR YEARS

AGP

AMERICAN GAS PRODUCTS CORPORATION
SUBSIDIARY OF
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GAS EQUIPMENT

HOUSE-HEATING...WATER-HEATING AIR-CONDITIONING*

offered by

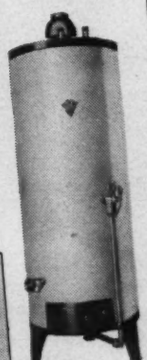
CONSOLIDATED EDISON COMPANY

Approved by American Gas Association Laboratory.

Automatic House-Heating. Hundreds of present users say this AGP "Empire" gas boiler is ideal for completely automatic gas heat. For either steam or hot water systems. The jacket is lustrous gray enamel on steel.

Air-Conditioning. This handsome AGP Series D air-conditioner brings complete winter air-conditioning to your home. It humidifies, cleans, and circulates healthfully warmed air throughout the house.

To Convert Your Present Boiler or Furnace to Gas. Fifty years' experience in designing heating equipment, and 25 years in gas equipment exclusively, are back of AGP conversion burners. There is an AGP model exactly suited to your heating needs.



Plenty of Hot Water day or night is assured by an AGP gas water-heater. Completely automatic, economical and dependable. A size for every home and purse.

Manufactured by
AMERICAN GAS PRODUCTS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
40 WEST 40TH STREET · NEW YORK, N.Y.

For more than half a century American Gas Products Corporation, a subsidiary of American Radiator Company, has been building heating equipment. For 25 years of this period they have specialized in the manufacture of gas equipment exclusively. Intensive product development and research have been carried on under the guidance and with the cooperation of the American Radiator Company—largest house-heating organization in the world. This wealth of experience is reflected throughout the entire AGP line of equipment for house-heating, water-heating and winter air-conditioning. For AGP units have an outstanding reputation for dependable, economical performance in actual operation in homes from coast to coast. You will find these AGP units on display in the showrooms of your Gas Company. They are included among the heating equipment for your selection because of proved ability to bring you all the advantages of gas, the perfect fuel for every major heating need.

Whether you are modernizing your present home, or building a new one, it is only good business to check up on the advantages of gas for house-heating and water-heating. Gas is clean and burns without soot or smoke. It is the one fuel so completely automatic in operation that it relieves you entirely of even the problem of supply! At today's low heating rates, gas brings definite economies along with its many other advantages over raw fuels.

Whatever your needs for up-to-date gas equipment, there is an AGP unit that is exactly right for your requirements—*because it's built for its job!* Check up for yourself on its compact design, attractive appearance and performance at any Gas Company showroom. Or, if you prefer, send in this coupon. It will bring you complete information on the full line of AGP gas equipment.

Tune in WJZ Every Sunday 6 to 7 P. M., New York's Own Radio Hour, "Echoes of New York Town"

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I am planning to ☐ modernize my presen
☐ build a new home

Please send me literature on AGP gas e
heating ☐ air-conditioning ☐ hot wate
present furnace to gas heat ☐

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City .....

This 7 column ad. from the N.Y. Herald Tribune

portunity to charge its members and make money for the club. The plan brings women into the Payne Furnace show rooms, and gives the gas company an opportunity to present new gas appliances to groups which could not otherwise be reached. Strange as it may seem, the costs are not high. All food advertising is excluded, and so the program is not commercialized in any way. The appliances are installed on a loan basis and changed periodically.

Employee education is a subject worthy of a great deal of study. Much has been said about it and comparatively little has been done. Certainly in these days of competition, a comprehensive program making every employee conscious of the superiority of gas would be a most desirable accomplishment. Home service co-operation in a program of this sort is absolutely essential. One lecture demonstration showing well-browned but juicily broiled steaks, four layers of cake evenly browned, waterless cooking on simmer burners and low-temperature roasting of meat will do more to convince employees than 20 pages of dull reading on the process of enameling and the B.t.u. input of burners. Much along this line has been accomplished by Victoria Warner, who has conducted a number of educational classes by the demonstration method.

The splendid results of home service work on the Pacific Coast have been due in a great measure to the enthusiastic co-operation and leadership of the various utility executives. After all, home service can only interpret its value to the utility, whereas the executive must have the foresight, the courage and the enthusiasm to make it a part of his promotional program. From there it's up to home service women to adapt their training and ingenuity along the lines of greatest sales results to the utility. The whole home service group of the P.C.G.A. is indebted to B. W. Reynolds, sales and advertising chairman, for the finest home service meeting ever held at a sales conference. The attendance was the largest and the enthusiasm the greatest. Incidentally, Mr. Reynolds is inaugurating in the Pacific Gas and Electric Co. an Appliance Counselor department. These are college trained home economics women who are helping dealers.

This article wouldn't be complete without a brief resume of the work being done by our Canadian friends at Vancouver. Under the direction of Jean Mutch, this department lists 20 sales promotional activities including a 10-week's sales course for company and dealer salesmen and kitchen planning service.

Last, but not least, is the announcement of two new departments, one for San Diego Consolidated Gas & Electric Co., organized last October and now building dealer promotion under the direction of Mildred Kier; the other for Coast Counties Gas & Electric Co. under the direction of Winifred Davison.

Gas in Multiple Cylinder Engines

(Continued from Page 40)

tates more frequent inspection of spark plug gaps.

Ignition Timing:

In the test engine referred to we found the low compression ratio required 10°-15° more advance than the high compression ratio to obtain best results. This is in general true because the higher temperature resulting from higher compression pressures accelerates combustion which necessitates a later ignition point to start burning if it is to be completed at the proper time. There is a wide variance in ignition advance requirement with different engines. We have found on dynamometer tests, ignition advances, ranging from 15 to 35 degrees for the same compression ratios on different makes of engines. We do not arbitrarily recommend ignition advance in going from gasoline to a dry fuel.

Carburetor Adjustments:

We have found that for full throttle operation the mixture ratio requirements for dry fuel are practically constant. At partial throttle the mixture in general must be slightly richer at the lighter loads to make up for leakage past valve guides and rings and also because of the lower compression pressure requiring a richer mixture. Due to the lower exhaust gas temperature at around 25 per cent load, there is no danger of burning valves with maximum economy mixture. Under certain types of loads where engine governors are called upon to maintain a constant unwavering speed there is danger of extremely lean mixtures causing hunting. The type of service required by the engine determines how near the carburetor can be adjusted to maximum economy.

In making a recommendation relative to carburetor adjustments, we wish to limit our suggestion to those carburetting devices which in the full throttle range supply a constant mixture ratio and in the part throttle range supply a mixture that is most economical for maximum manifold depression.

In general we believe that when adjusting a carburetor to deliver mixtures for partial throttle, the mixture can safely be leaned until the maximum manifold depression has been decreased about ½ inch of mercury. For full throttle, continuous maximum power operation, the carburetor should be adjusted for maximum economy without a loss in engine r.p.m.

Exhaust gas analyzers have been used in some instances for adjusting dry gas mixtures, especially butane. Our laboratory experience indicates in comparing analyzers with our means of measuring air gas ratios, which we have used over a period of years and which we know to be accurate, that the calibration of these instruments is not right for dry fuels. Due to the wider air fuel ratio combustion limits of dry fuels over gasoline, we have found that analyzers fail to indicate abnormally lean mixtures.

Intake Manifolds:

The type of service we find engines operating under indicate two intake manifold requirments. We have found by laboratory test that if the maximum load required is below that possible with a hot manifold and dry fuel, that fuel economies with dry fuels over the entire operating range are not affected by normal manifold heat. In such instances it is then possible to use a combination of fuels without sacrificing performance and economy on gasoline.

When requirements are for maximum power on dry fuels, it is necessary to cool the manifold and increase its cross-sectional area in most instances. The amount the manifold cross-sectional area should be increased, disregarding inlet valve opening restrictions, depends upon the volume of gas added to the air. When 500 B.t.u. gas is used the extra volume the manifold is required to pass is equivalent to 20 per cent. We believe that dry gas manifolds should be at least 20 per cent larger than for gasoline and should favor circular rather than box type sections. In one instance in our laboratory we found it possible to increase the B.hp. 30 per cent by increasing the manifold size and putting on a larger carburetor.

Electrogas air-Conditions and Serves the Nation!

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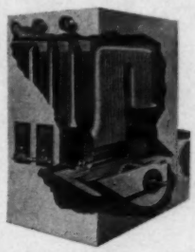
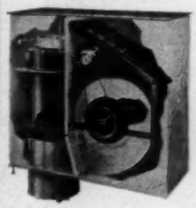
72,000 BTU
AGA Approved
20 x 23 x 67



Electrogas
STREAMLINE
66,000
to
500,000 BTU
AGA Approved



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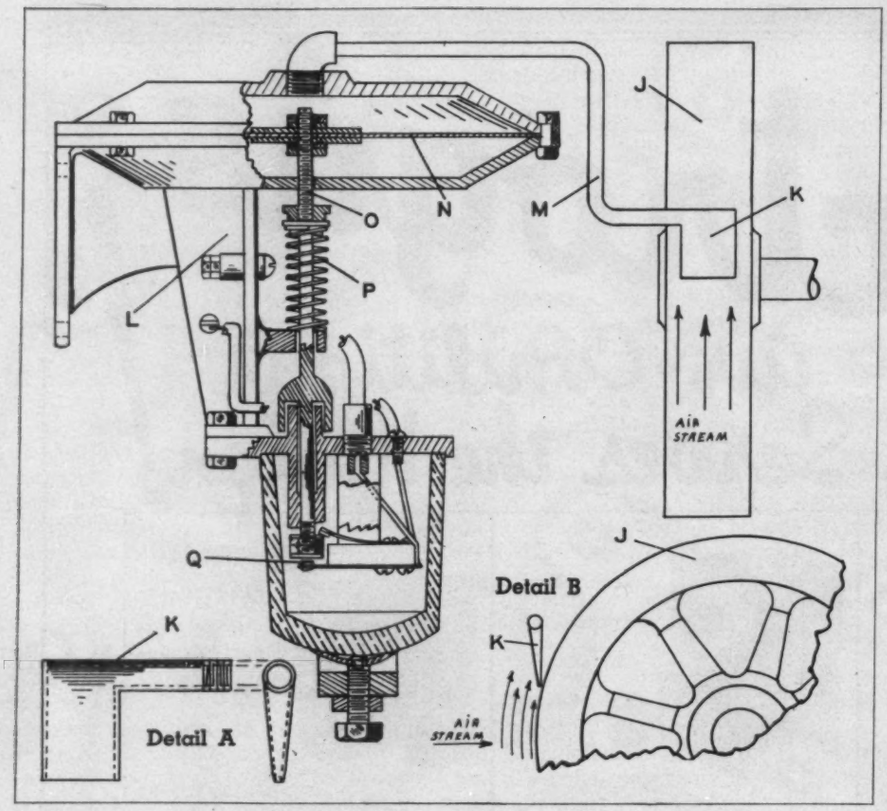


FIG. 1. Over-speed control for gas engines.

Over-speed Control for Gas Engines

● E. V. STONE, Stone Safety Instruments Co., Los Alamitos, Calif., in paper to Compressor Plant Sub-Committee, Pacific Coast Gas Association Spring Technical Conference, Los Angeles, Calif., March 18-19, 1937.—(Abstract by GAS).

THE necessity for successful over-speed control for gas engines is self-evident, in that such control is not only good safety practice, but also protects the engine from damaging itself or surrounding property. Gas engines of large size should not be allowed to operate without reliable over-speed equipment, because they are capable of excessive speed in the event of the failure of their mechanical speed governors, especially when suddenly under loaded.

E. V. STONE

There are several types of over-speed control on the market, most commonly referred to as the automatic stop. Although this stop works fairly well, it has characteristics which are both troublesome and unreliable, and it cannot be regarded as fully automatic, in that when it stops an engine it must be reset before the engine can be started. Further, if it be adjusted to function before an appreciable degree of overspeed is attained it will often stop the engine when the engineer has just gotten it started. This hinders the engineer and may force him to discontinue the use of the automatic stop by disconnecting the grounding wires from the ignition system, in order to keep his engine running when he most needs it. On the other hand, if the automatic stop is adjusted so that it will not stop an engine when it momentarily overspeeds when started, it then is apt to allow the engine to run too fast before it functions. This will eventually bring on undue repair costs.

Before an over-speed control can be regarded as satisfactory it must fill all the following requirements: be 100 per cent automatic in operation; capable of adjustment while the engine is running; functionally independent of the attendant; capable of holding engine over-speed only slightly above the normal operating speed; never stop the engine or interfere with its normal operation; capable of reliable operation for reasonably long periods of time without attention; function independently, separately and apart from the speed governor of the engine; be vapor proof.

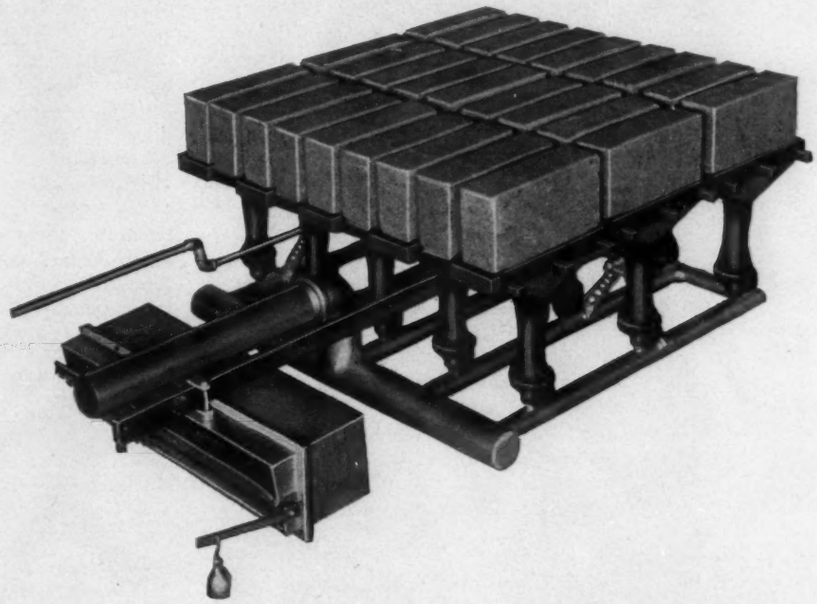
A recent new development in over-speed control for gas engines, which appears to fulfill the above mentioned requirements, has been in use for about one year, and is reported to be highly satisfactory.

Fig. 1 shows the fundamental principles upon which this new device operates. The control mechanism L is shown greatly exaggerated for clarity of illustration.

Starting with the flywheel J, it would be impossible to rotate the flywheel without creating a circular stratum of moving air around the periphery thereof, and further, the velocity of this stratum will vary directly as the speed of the flywheel varies; therefore, when the kinetic energy of this moving air stratum is converted into pressure by the conversion nozzle K, the pressure created in the nozzle will vary as the square of the speed of the flywheel J. This pressure is transmitted to the over-speed control L through the tubing M connecting the nozzle K with the control L. Since the column of air in the nozzle and tube is static, there is practically no pressure drop. This pressure is concentrated on the push rod O through diaphragm N, and subsequently opposes the pressure of the spring P, which in turn is adjustable to slightly overbalance the pressure on diaphragm N when the engine driving flywheel J is operating at normal speed. Due to the ratio of pressure increase on the nozzle K over the speed of the flywheel J, when the engine tends to over-speed, increased pressure transmitted to diaphragm N overbalances the pressure of spring P and moves the contacts Q into electrical contact which in turn short circuits the ignition system of the engine, and thus robs the engine of its power. At this point the engine immediately starts to slow down whereupon the electric contact is broken at Q, due to the slower speed of flywheel J, and subsequently lower pressure on diaphragm N. This action goes on intermittently and results in controlling over-speed of the engine continuously at a point only slightly above the normal operating speed of the engine. The contacts Q are designed to operate within an oil bath, thus making this switch mechanism vapor-proof.

(Turn to Page 48)

PERFORMANCE



WECO-N.G.E. 600 SERIES Gas Burners

BOOTH
No. 100

AGAEM Exhibition and AGA Natural Gas Convention, Kansas City—May 10 to 14.

Quietness of operation, wide range of turn down, and simple installation, permit its use on jobs that are ordinarily considered impossible to convert to gas firing satisfactorily.

The 600 Series Gas Burner is designed for use in steel fire box and sectional type heating boilers.

The refractory top, made of standard fire brick easily accessible and simple to install, performs the same function of transmitting radiant heat to the furnace walls that a glowing coal bed does. The burning gas produces the proper flame length to burn without impingement on the boiler heating surfaces, and with a minimum of combustion space.

Write for complete dimensions and capacities.

THE WEBSTER ENGINEERING COMPANY

Tulsa, Oklahoma

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Pacific Coast Distributors

NATURAL GAS EQUIPMENT, INC.—LOS ANGELES—SAN FRANCISCO

F. J. Evans Engineering Co. - Birmingham | Gas & Heating Specialty Co. - Dallas | Mechanical Equipment Co. - Houston

This type of over-speed control is a great aid to the attendant when starting an engine, as it will prevent the usual momentary over-speed when starting and will not hamper him in his work by shutting down any of his engines, and thus rob him of much needed power.

The nozzle K must always be installed so that the receiving open end looks in a downward direction, so that oil accumulations will not run into it. Some oil, dust and other foreign matter may collect within the nozzle, but since there is no flow of air through the nozzle and tube, accumulations in the tube will not occur. It is highly improbable that particles of matter such as dust, lint, etc., would penetrate the circular stratum of air rotating in common with the flywheel periphery, so as to reach the nozzle which is situated at the extreme bottom of this rotating stratum, due to the tangential motion imparted to these particles by the centrifugal force. This has been verified by the fact that one of these nozzles which was installed in a compressor plant situated in a dusty location had but a very slight amount of dust accumulation within the open end of the nozzle after being in continuous service for several months.

The nozzle can be easily and quickly inspected and cleaned every few months when the engine is shut down, it being merely necessary to insert a wire or hacksaw blade into the open end to dislodge and remove possible accumulations.

If the nozzle K is removed for any reason it will be necessary to readjust the control because the pressure developed in the nozzle varies with its position relative to the flywheel J.

Detail A in Fig. 1 is a detailed drawing of the nozzle K.

Detail B in Fig. 1 is a fragmentary side view of the flywheel J and nozzle K.

Expressed in inches of water column gage, the average nozzle pressure developed at the flywheel periphery of the average large size slow speed gas engines, used in the gas industry, varies from about 0.3 to 0.8 inch, while the smaller type slow speed gas engines will develop a minimum pressure of about 0.1 to 0.2 inch at the nozzle. All the high-speed multicylinder engines will develop a minimum nozzle pressure of about 0.1 to 0.3 inch.

This new over-speed control can be applied to any type of gas engine without making any machine changes in the engine itself, and further, the control itself is not necessarily attached to the engine, but can be attached to some stationary object nearby.

Trends in Modern House Heating

● **W. H. McINNIS, General Sales Manager, Memphis Power & Light Co., Memphis, Tenn.; addressing Southern-Southwestern Regional Gas Sales Conference, Memphis, Tenn.; March 10, 11, and 12, 1937.—(Abstract by G A S).**

IT IS a gas company's obligation to sell heating equipment to fill the needs of the user. It is obvious that the modern winter air conditioning systems, because of first cost, cannot be readily sold to customers whose incomes are less than average, and in order to sell volume, equipment must be sold that these customers can afford to buy and operate. In this category come the flame heater, radiant heater, circulator, floor furnace, and gas fired radiator.

The flame heater and the radiant-fire heater, on account of the low first cost, are easiest to sell in volume, and, properly applied, they render a first-class heating service. Experience has shown that they introduce the customer to the advantages of gas heating, and many customers who can afford better heating services replace these with more modern units.

Studies during the past two heating seasons of records of customers who purchased either flame or radiant type heaters, show that their gas consumption increased on the average of 13.4 M c.f. for the Memphis Power & Light Co. and 16.7 M c.f. for another Southern gas company.

The next most popular heating device is the circulating heater. The renter in particular who wishes to take his heater with him if he moves, will buy a circulator in preference to other types of general heating equipment. It also has a market in types of houses where central heating equipment cannot be installed; for instance, in houses built close to the ground or where it is impractical to install equipment requiring more floor space and head room. It can be equipped with heat control devices, making it automatic and giving it practically all the advantages of central fired equipment and at a very low cost.

The records from one other Southern gas company show that during the 1935-36 heating season, 29.5 per cent of their total estimated annual revenue obtained from heating equipment sales for that season was from circulating heaters.

During the past three years, the floor furnace has met with increasing popularity, brought about on account of its low first cost, its ease of operation, its low operating cost, and its ability to fulfill its heating requirements. It can be equipped with control devices, making it as automatic as any central fired plant. A comparison of installation costs in Memphis shows that two floor furnaces, which are usually required to furnish adequate heating for the small home, cost about 50 per cent less than central fired coal heating.

In selling floor furnaces, it is necessary to:

1. Use care in determining the capacity and location of the unit.
2. See that the installation is made safe by providing adequate venting facilities and sufficient room for air circulation.
3. See that the user is given fundamental instructions in operation.

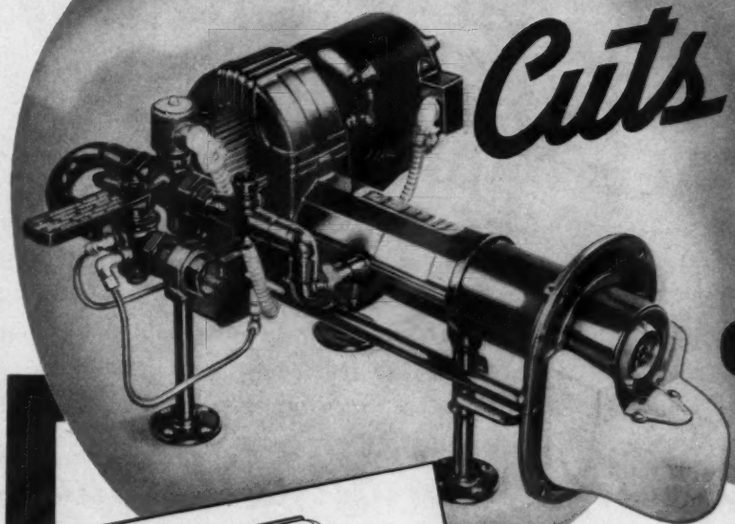
In checking the consumption of 50 customers after they had purchased floor furnaces, against that used during the previous year, it is revealed that the average annual consumption of gas was increased 104 M c.f. per customer.

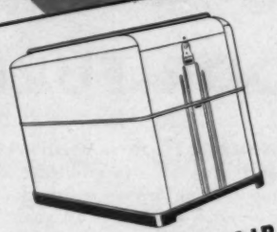
One of the most flexible types of heating is the gas fired radiator. It can be placed almost anywhere, which is not the case with many types of heating equipment. Its ease of installation, its ease of control, its adaptability to automatic control, and its low operating cost make it a most desirable heating medium. The gas fired radiator is especially adapted to second floor heating where vents are not easily obtained and where it is difficult to make installation of other types of heating equipment.

In the replacement field, the conversion burner will continue to hold a prominent position. Many houses now using oil or coal have splendid heating equipment, representing a considerable investment. This is true especially in the medium and larger class of homes where sectional type boilers are installed. Higher operating efficiencies are obtainable due to the increased heating surface built into the boiler. Under improved methods of installation and engineering application it is possible to give this class of customer a very satisfactory and economical heating service through the medium of the conversion burner. In Memphis, nearly 100 conversion burners replaced oil or coal during 1936, representing an average gain to the company of approximately 120 M c.f. per customer involved.

NORGE

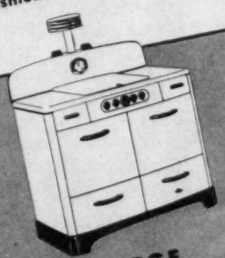
Cuts the Cost OF HOME COMFORT





NORGE FINE-AIR CONDITIONING FURNACE

● Because of the special design of its heat transfer unit, this furnace is able to deliver up to twice the amount of heat usually extracted from fuel by old-fashioned systems.



NORGE CONCENTRATOR GAS RANGES

● Only Norge Gas Ranges have the famous Concentrator and Simmer-Concentrator burners. Many other exclusive features. Norge ranges lead in style, performance, and economy of operation.

HC-13

NEW GAS BURNER *with* CONTROLLED COMBUSTION

Breaks Records for Economy!

NOW YOU CAN SELL GAS HEAT on an economy basis! The revolutionary design of the new Norge Gas Burner gives economy never before possible with this type of fuel. Triple-control of gas and air gives perfect combustion under all conditions of draft and weather.

For greatest efficiency it should be used with the Norge Fine-Air Conditioning Furnace which is in itself a new advance in home heating equipment. The Norge Gas Burner is fully approved by the American Gas Association. Get full details today from your nearest Norge distributor or write direct.

NORGE

HEATING AND CONDITIONING DIVISION

Borg-Warner Corporation, Detroit, Mich.

Prepare for of

BE SURE TO LOOK ME UP IN KANSAS CITY!

I'll be in the WARD FLOOR FURNACE exhibit...to your left as you enter the exhibit hall in Kansas City. It will be worth your while to look me up and find out more about the superior heating appliances I represent.

Facts You Should Know—

ABOUT WARD FLOOR FURNACES

The Ward Floor Furnace is built in a sturdy, complete package. No wires to run, no assembling to do. The furnace hangs from joists beneath the floor, and a handsome register at floor level is all you see. It draws in the air from the floor, doing away with that unpleasant cold zone below the knees. It warms the air evenly, to temperature desired, against the sides of the *vented* combustion chamber and returns it to the room. Air of rooms never contacts flame, is kept clean and fresh, circulating steadily...changing completely 3 to 6 times an hour.

Ward "Complete Package" Features Include . . . .

BILT-IN THERMO-CONTROL...the most accurate thermostat developed for floor furnaces. Part of the furnace, it contacts all of the air as it passes through, giving unusually dependable control of comfort.

FLAME FENDER...a cast iron inner lining which surrounds the burner, keeps flame from impinging on any vulnerable part. Prevents burning out; adds years to Ward's ten year guarantee.

AUTOMATIC PILOT...a Ward perfected safety device that is dependable and sure. Shuts off main gas lines if flame is extinguished...burns with steady blue flame, consumes all gas.

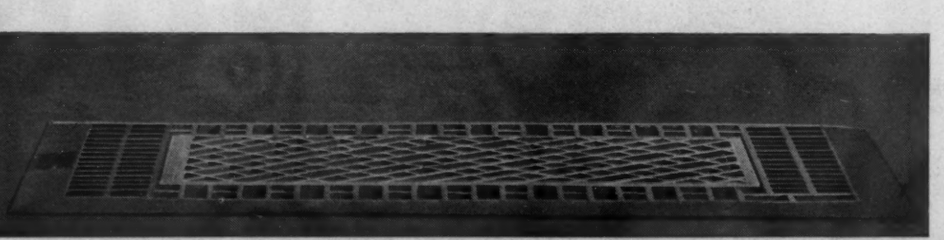
CRADLE CIRCULATOR...an "air conditioning" feature which insures steady air flow, increases heating efficiency as much as 20%. Makes air movements steady and continuous, eliminating hot blasts, frigid floors and chilly corners.

REMOVABLE REGISTER...Registers and inner shells of 1937 Wards are readily removable, making furnace easy to get at for cleaning.

STURDY CONSTRUCTION...WARD FLOOR FURNACES are built of 16 and 18 gauge rust-resisting TONCAN IRON—there are no delicate parts to get out of order.

A Ward is simple, inexpensive to install. Drop the furnace into the floor opening . . . connect to vent and gas line, and it's ready to go to work. An experienced gas fitter can install a Ward Floor Furnace in less than a day.

Wards are A. G. A. approved with all accessories in *exactly as they are installed.*



YOUR LOAD IS AS GOOD AS

your biggest year load building profits

More people have more money this year to buy *comfort.* That's why you should make this your biggest load building year by selling more appliances that provide the comfort and economy of gas . . . the most efficient fuel for heating.

Give serious thought now to the coming heating season. Plan to feature gas heating appliances that are *permanent* equipment . . . that will build and protect load and insure consumer satisfaction *for years to come.*

That's the sort of heating equipment WARD FLOOR FURNACES are! Dependable . . . economical . . . efficient . . . and *permanent!* Once in, WARDS stay in. They become a part of a building and aren't readily removed to be replaced by other appliances using other types of fuel. Guaranteed for ten years . . . many WARDS have given excellent service, in all sorts of climates for more than twice that long.

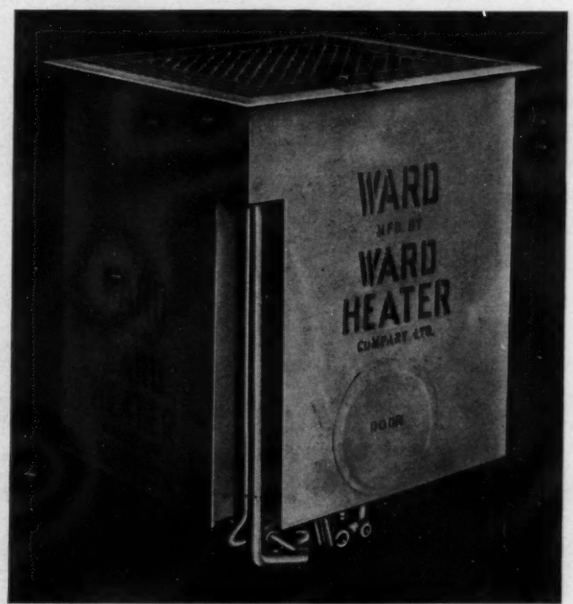
Along your gas lines are hundreds of one-story homes, stores and offices that can most ideally be heated with the controlled, evenly circulated, healthful warmth of WARD FLOOR FURNACES.

So get acquainted *now* with the facts about WARDS. Let them help make this *your biggest year for merchandising profit and load building success.*

May we repeat . . . "your load is as good as the appliance you sell. *Sell the best . . . sell WARDS!"*

MORE THAN 325,000 WARD FURNACES are in use today...and more of them will be installed by utilities and dealers throughout the country in 1937 than in any previous year of their history!

★ Would you like to know more about the experience of other utilities with WARD Floor Furnaces . . . and the important place they can fill in *your* merchandising program? Ask us to send you details with new catalog and price list.



WARD
FLOOR FURNACE

WARD HEATER COMPANY
1800 W. WASHINGTON BLVD. • LOS ANGELES, CALIF.

REPRESENTATIVES:

J. E. Davies, Peoples Gas Building, Chicago, Illinois

A. S. Kincaid, 2012 Harwood Ave., Dallas, Texas

F. E. Reilly, 200 Davis St., San Francisco, California

H.C. Sanderson, 207 Fulton Bldg., Pittsburgh, Penn.

J. H. Stubbins, 300 E. 68th Terrace, Kansas City, Mo.

THE APPLIANCE YOU SELL

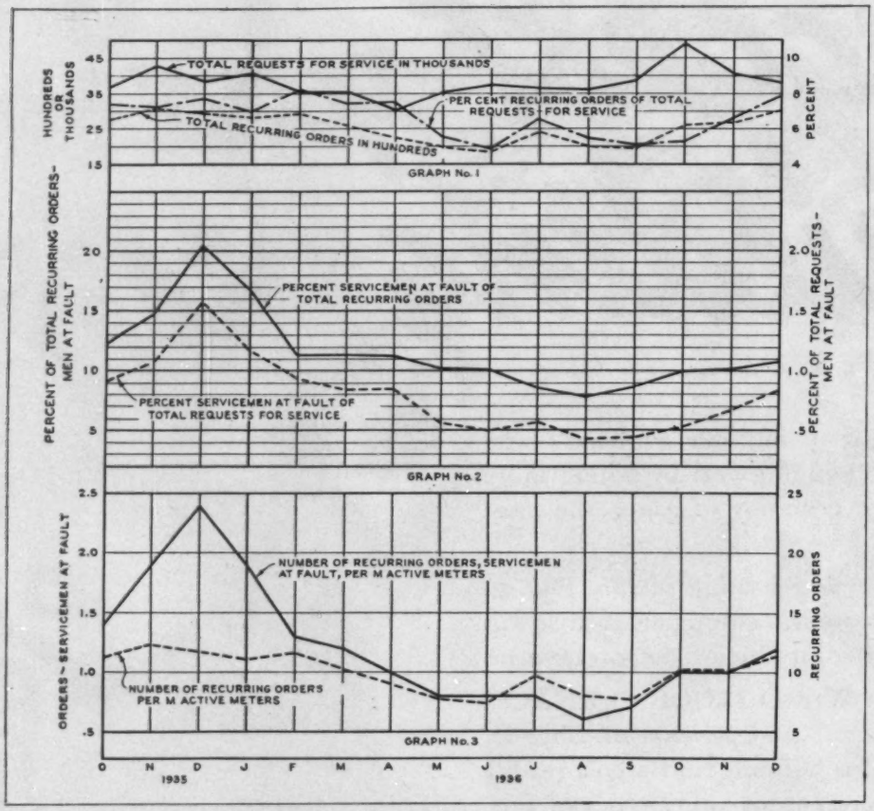

TOTAL REQUESTS FOR SERVICE IN THOUSANDS
PER CENT RECURRING ORDERS OF TOTAL REQUESTS FOR SERVICE
TOTAL RECURRING ORDERS IN HUNDREDS
HUNDREDS OR THOUSANDS
PERCENT
GRAPH No. 1
PERCENT SERVICEMEN AT FAULT OF TOTAL RECURRING ORDERS
PERCENT SERVICEMEN AT FAULT OF TOTAL REQUESTS FOR SERVICE
PERCENT OF TOTAL RECURRING ORDERS - MEN AT FAULT
PERCENT OF TOTAL REQUESTS - MEN AT FAULT
GRAPH No. 2
NUMBER OF RECURRING ORDERS, SERVICEMEN AT FAULT, PER M ACTIVE METERS
NUMBER OF RECURRING ORDERS PER M ACTIVE METERS
ORDERS - SERVICEMEN AT FAULT
RECURRING ORDERS
GRAPH No. 3
O N D J F M A M J J A S O N D
1935
1936

FIG. 1. Graphs showing effects of systematic job training of servicemen.

Central Station and Remote District Employee Training

● **LEE HOLTZ, General Superintendent, Manufacture and Distribution, Southern California Gas Co., Los Angeles, Calif.; in paper to Sub-Committee on Employee Training for Customer Utilization Work, Pacific Coast Gas Association Spring Technical Conference, Los Angeles, Calif., March 18-19, 1937.—(Abstract by G A S).**

THE respective areas of the several operating divisions of the Southern California Gas Co. vary from a minimum of 334 square miles in which are located about 114,000 active domestic meters, to a maximum of 4,345 square miles wherein there are less than 4,000 active members at present. The most distant area is 190 miles away from the Los Angeles headquarters. It will be readily appreciated that a rather flexible educational organization is required for the administration of job training in this system.

LEE HOLTZ

After considerable time had been given to the study of job training organization both on the Pacific Coast and in the East, the task of establishing a system was begun.

The courses to be given covering the Electrolux, high bill investigation, ranges, water heating, meter turn-on and close, and emergency training were prepared by a curriculum committee, the members of which were selected from all departments to insure a balanced program. These courses were approved by an educational committee in charge of all educational activities of the company.

Actual instruction responsibility was vested in a job training instructor whose 15 years of appliance servicing and distribution experience qualified him for this important duty. Classes were held regularly for service men stationed within a radius of about 30 miles from the central station teaching headquarters.

With this end in mind a plan was formulated where also the job training instructor made regular trips and held classes in the remote districts for the benefit of the service men located in the respective localities. Portable cut-away models were used as an aid in instruction lectures and the men were required to readjust properly various types of appliances which had been thrown into maladjustment. This system was used for approximately three years and it seemed that little more was to be desired in the way of smooth running organization.

However, it was ultimately realized that the system had one shortcoming —the time required for the job training instructor adequately to cover the several districts. It often occurred that while instructing at one location he was needed at the central station or some other division. It also frequently happened that during the instruction period allotted to some particular district the service men in that locality were too busy to attend the classes and keep up their routine service work.

To remedy this condition, the program was altered to its present status. The company's system is now divided into six general divisions or districts and a number of district key men have been selected as sub-instructors for their respective areas.

Under this more practical plan the job training instructor need spend only sufficient time in each outlying district to transmit any desired educational data to the key man for that area. This leaves him time to contact appliance and appliance accessory manufacturers, inspect newly developed appliances and accessories and compile any information regarding possible service problems which might arise when the devices appear on the market.

The responsibility of individual instruction now rests primarily with the district key man. Should some important change in appliance servicing procedure be required, the present system could function to inform every service man in the company's system within a short time.

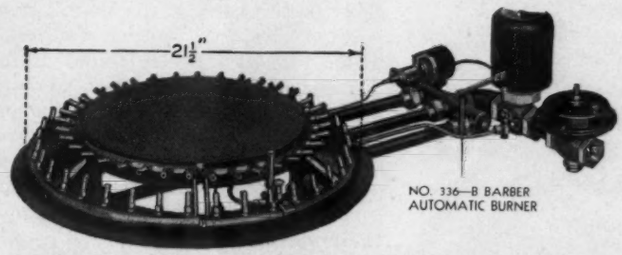
Another advantage is found in the ease with which service instructions are kept uniform over the system. Regular calls by the job training instructor are made to every division every month, one or two days generally being sufficient for the completion of this work with the key men and lecture groups of service men.

The average number of service men to each key man varies from four to 27, depending upon the conditions existing in the various outlying districts.

The average number of active me-

An Outstanding LINE of BARBER BURNERS

Offers You Products That Will SELL and PERFORM

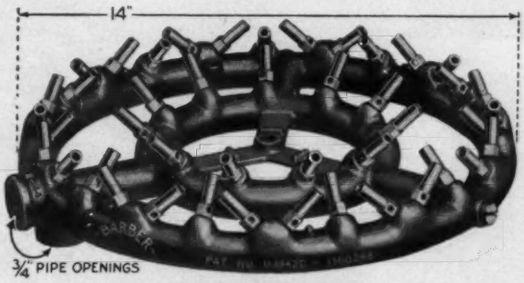


NO. 336—B BARBER AUTOMATIC BURNER

Conversion Burner for Round Furnaces or Boilers

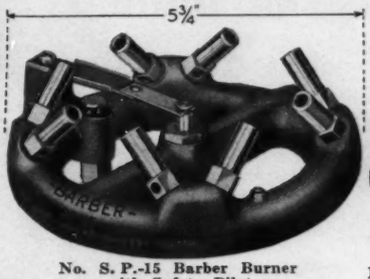
Made in eight different sizes to handle round grate diameters from 12" to 34". Also tailor made to suit and fit the grate dimensions of oblong furnaces and boilers. Insures proper scrubbing flame action on side walls of firebox, and the 1900° Flame Temperature develops the highest possible efficiency and economy. Equipped with Baltimore Safety Pilot for positive and accurate Safety control. Listed in the A. G. A. Directory of Approved Appliances.

A FAR MORE complete range of improved Barber Products now awaits your acceptance. It's worry off your mind, to familiarize yourself with Gas Burning Equipment which is really PERFECTED. Shown here are merely a few items from Barber's wide selection of Gas Burners for numerous Appliances, Gas Pressure Regulators, and Controls. Get the WHOLE story! We offer you the experience and facilities of our Engineering Department for your Gas Burner problems. Write today for No. 37 Catalog and Revised Price List.

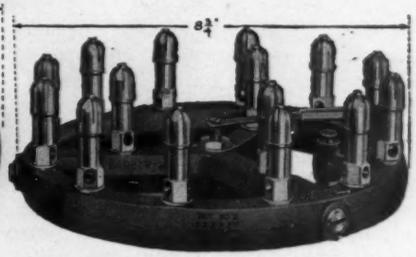


No. X-44 Barber Burner Unit

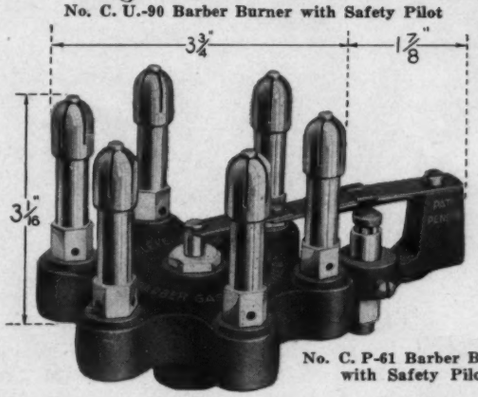
No. C. U.-90 Barber Burner with Safety Pilot



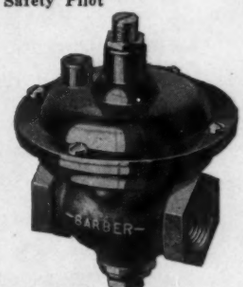
No. S. P.-15 Barber Burner with Safety Pilot



No. C. P.-150 Barber Burner with Safety Pilot



No. C. P-61 Barber Burner with Safety Pilot

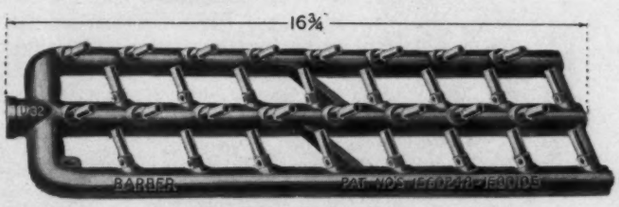


Barber Gas Pressure Regulators A.G.A. Approved

Made in the following sizes: ¼", ⅜", ½", ¾", 1", 1¼", 1½", 2".

BARBER BURNERS and Regulators are Adaptable to Such Appliances as:

- Air Conditioning Equipment
- High Pressure Boilers (Tubular and Tubeless)
- Bakery Ovens
- Doughnut Kettles
- Metal Pots
- Garage Heaters
- Coffee Urns
- Hair Dryers
- Space Heaters
- Floor Furnaces
- Clothes Dryers
- Water Heaters
- Confectioners' Stoves
- Vulcanizing Machines
- Pressing Machine Boilers
- Japanning Ovens
- Core Ovens
- Banana Room Heaters and many other Appliances



No. U-32. Barber Burner

THE BARBER GAS BURNER CO., 3704 Superior Ave., Cleveland, Ohio

Address Michigan Inquiries to The Barber Gas Burner Co. of Michigan, 4475 Cass Ave., Detroit

BARBER *Automatic* JET GAS BURNERS

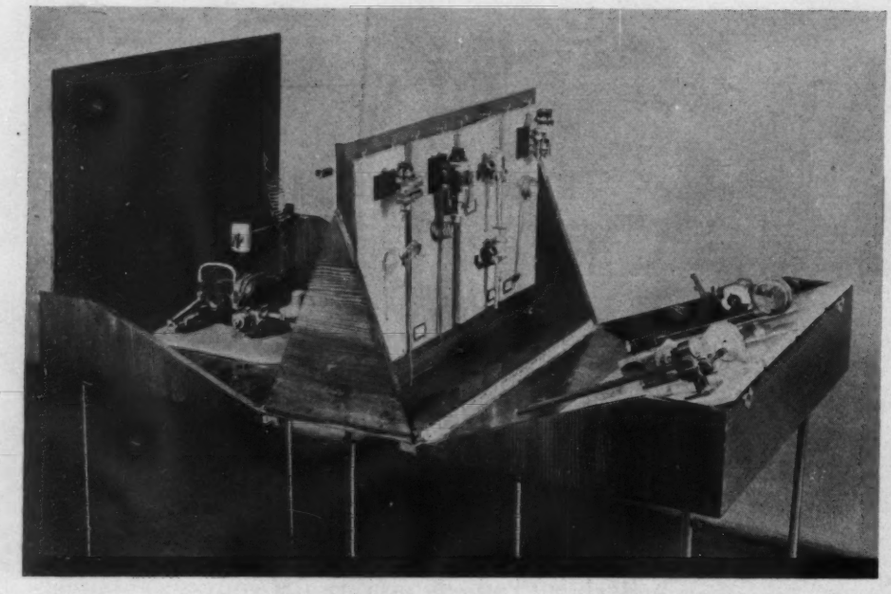


FIG. 2. Portable Appliance Accessory Display.

ters per service man varies from 940 to 1,538 in the several operating divisions.

It has been noticed that for every letter formerly received criticising the service, several letters of commendation are now sent by appreciative customers. This is one measure of the effect of systematic training upon the ability of service men.

A second method of measuring the progress brought about by the organized teaching program has been established: A systematic monthly analysis is made of all repeated or recurring customer requests for service. The data are tabulated on a form which has columns to record the name and address of the customer, the date and nature of the order, the work done, the foreman's explanation, the name of the service man, and whether the fault lies in the appliance or with the employee. Each case is checked through the respective foreman and classified into one of three following groups:

1. The appliance being obsolete or in poor condition could not be satisfactorily adjusted under any circumstances.

2. The customer was so critical that no arrangement would be satisfactory.

3. The service man was not properly informed to execute the job satisfactorily or he did not put forth his best efforts.

The general trend of the ratio of service failures to the total number of service requests completed is shown in Fig. 1. The record extends back only to the fall of 1935 at which time the method was initiated, but it appears that the efficiency of the employees doing service work is increasing in spite of the fact that appliances of every type are becoming more complicated with each new model.

The increase shown during the past few months is probably due to the fact that district group conferences were held during the course at which time the company's attitude was made clear to the men in the field. It was pointed out that service failures in which employees were found at fault did not necessarily reflect upon the individual. Perhaps those responsible for them were being asked to do more than they were capable of doing well or perhaps the company had failed to give them sufficient instruction in their work.

Fig. 2 shows the open view of the Portable Appliance Accessory Display, which is commonly referred to as the Portable School. This folding box is fitted with any desired selection of models and loaned to the various outside divisions for instruction and demonstration. The small blackboard shown attached in Fig. 2 is useful for illustrative sketches. The overall dimensions of the display when closed is approximately 16 inches wide, 24 inches high, and 36 inches long. The weight, of course, depends entirely upon its contents, but it is possible for one man to handle it alone if the necessity arises.

The Industry's National Advertising —Today and Tomorrow

● **BERNARD J. MULLANEY, Vice-President, Peoples Gas Light and Coke Co., Chicago, Ill.; addressing the Mid-West Regional Gas Sales Conference, American Gas Association, Palmer House, Chicago, Ill., February 18-20, 1937.—Abstract by G A S).**

TODAY National Advertising is here. That *something which had to be done* is now actually being accomplished.

Tomorrow, all gas men who believe in advertising—and it is assumed all do — will want more of it. And the one sure way of getting more of something we want is to show those who can give it that good use is being made of what we already have.

B. J. MULLANEY

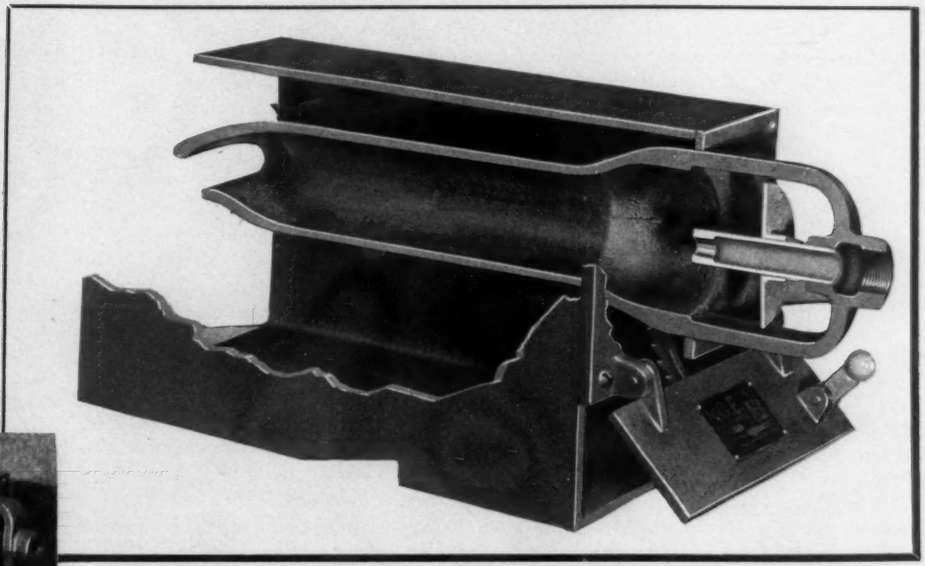
Successful national advertisers recognize the principle of making national advertising and local sales-effort work as a team. The broad function of their general advertising, as of the gas industry, is to create a favorable "atmosphere," in which local effort and personal selling can operate more easily and effectively.

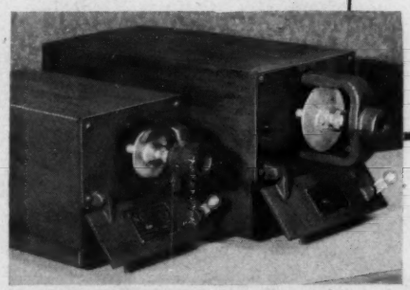
As an illustration, some years ago the Peoples Company was preparing to intensify the push of industrial business. Advertising was in consideration. But what kind? Aimed at whom, and in what kind of media? Most thoughts were directed at higher executives — production superintendents, plant managers and company officers. Finally the most experienced sales promoter in the group said: "The horizon of your outlook is too narrow. Practically everybody in this city that ever gives a thought to gas service, thinks of it in terms of the kitchen stove. What you need is a background, an 'atmosphere'—a community recognition and acceptance of gas as a fuel—and even more than just fuel—recognition of it as a tool in the industrial processes that call for applications of heat."

The upshot was advertising to the entire community that you could "do it better with gas," in the shop and factory as well as in the home. Prob-

N·G·E·

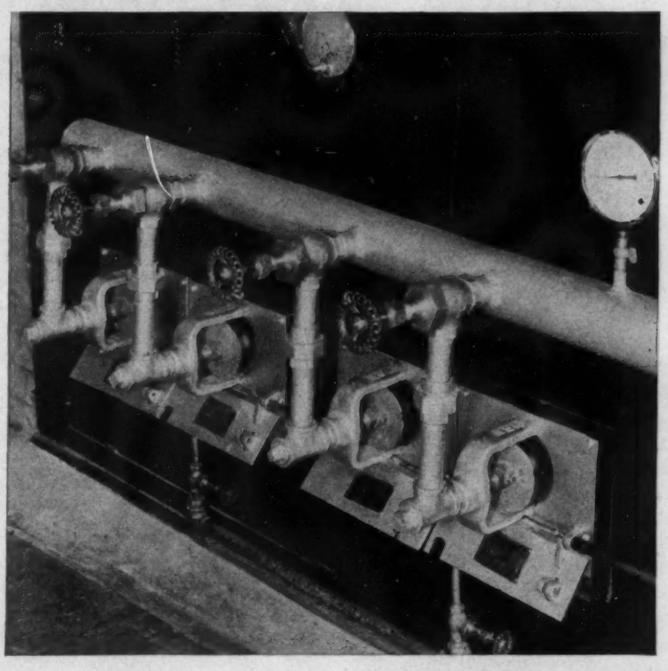
VENTURI TYPE
GAS BURNERS
TYPES 10-B & 11-B





CONVERSION MADE EASY

FOR LARGE INDUSTRIAL BOILER PLANTS



Gas companies say that N.G.E. Venturi Types 10-B & 11-B Burners are ideal for converting large industrial furnaces to natural gas. Here are the reasons:

1. Simple installation; size and shape to fit existing openings without damage to boiler front or costly changes in setting. 2. Large capacity where boiler front space is limited. 3. Substantially made of cast iron and bronze, with no breakable, projecting or separate parts. 4. The Venturi principle of air injection and automatic proportioning, permitting operation with minimum stack draft. 5. Separation and provision for accurate and easy control of primary and secondary air. 6. Special adaptation to high B.T.U. content fuels. 7. High efficiency at any gas pressure from a few ounces to 8 pounds. 8. Quiet, vibration-free operation at all loads. 9. Elimination of tendency to burn back at low turn-down. 10. Safe to light and operate; particularly adapted to automatic control. 11. Readily adaptable to combination oil and gas operation. 12. High return on investment through savings in first cost and maintenance. Write for descriptive bulletin.

. . . LOOK TO THE PIONEERS
FOR CONTINUED LEADERSHIP

NATURAL GAS EQUIPMENT, INC.

PETROLEUM SECURITIES BLDG.
LOS ANGELES, CALIF.

1123 HARRISON STREET
SAN FRANCISCO, CALIF.

BAKERSFIELD, CALIFORNIA

Natural Gas Equipment Co. of Texas, 811 Sterling Bldg., Houston, Texas

ably not one sale could be traced directly to that advertising. But the Industrial Department soon found itself working in an "atmosphere" of acceptance so favorable that everybody concerned was well satisfied.

In much the same way the national advertising and its auxiliaries are cultivating an "atmosphere" favorable to selling gas service and gas-using appliances. In times past every enthusiastic gas man has ground his teeth over the lead electrical competition seemed to have over gas in getting into print. National advertising and its auxiliaries are changing all that — logically and naturally and ethically.

According to the best check-up obtainable, the ratio of articles on gas to articles on electricity, in national women's magazines, newspaper, etc., is getting close to a fifty-fifty basis, which is immensely better than it used to be. As examples, attention is directed to the articles in the February *Delineator*, the February *Ladie's Home Journal*, and *McCall's* for March.

In addition, there is the play the gas industry can get, and is getting, in the advertising of other industries and businesses — makers of equipment and appliances, food stuff manufacturers, and so on. Motion pictures are another example and it is reassuring to know that when a range or other appliance appears in pictures it is up-to-date and attractive, and not a relic.

It is not always easily realized how the advertising and its auxiliaries operate—how they work in local territory, even though not producing specific sales as results of a particular advertisement.

National advertising has "put us on the map," and when an industry or a service is thus "put on the map," editors are quick to see it and are prompt to act accordingly and help spread the news.

What follows comes as naturally as the gas-jet responds to the range toplighter. When, for example, Mrs. Green, Mrs. Brown, Mrs. Black and Mrs. White finish the bridge game and chat about home affairs, as they mostly do, one or another is bound to interject an observation, a statement, or a question originating somewhere along the line in what the national advertising and its auxiliaries have been doing.

The rest of it is up to us of the local gas companies, and to what we have done by tie-in to localize and focus the general campaign. If we have done a good job, Mrs. Green, Mrs. Brown, Mrs. Black or Mrs. White will connect up the bridge table interjection with something she has seen, read, or heard locally—in an advertisement or other print, at a salesroom, from a salesman, or from a neighbor—about ranges, refrigerators, water heaters, or house heating. And from there on, helped along by consistent sales promotion, the progress is from interest to action that puts figures on the sales report.

The nub of these sketchy and rambling observations is this: let us "get religion" on this National Advertising Campaign, and tie in our local efforts with it—not in just one or another detail, but in all conceivable ways—in our local advertising, in our sales programs, in our contacts with other dealers. And don't overlook fellow employees.

Fellow employees are in circulation among potential customers all the time. They like to talk, as most people do, about the business they are in. This up-to-date gas service topic, when made clear to employees, gives them a chance to get enthusiastic, maybe a little boastful. And in doing this, they are not only promoting sales but are also increasing their own interest and confidence in the business.

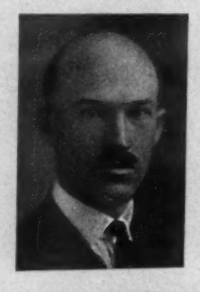
Gas appliance manufacturer interest should be stimulated to a greater extent. There is a large and uncultivated field for cooperation from the manufacturers, and some nudging from gas company customers should help open it up.

Through A.G.A. headquarters and the committee that is directing the national campaign, there is available an abundance of tie-in suggestion and tie-in material. Adequate use of it will wipe out all doubt of what to do about "National Advertising—Today and Tomorrow."

Clock-Controlled Range Promotion In the Southern California Area

● **CLYDE H. POTTER, Commercial Manager, Southern Counties Gas Co., Los Angeles, Calif.; in an address, "1936 Clock-Controlled Range Promotion," presented before the Spring Sales and Advertising Conference, Pacific Coast Gas Association, Los Angeles, Calif., April 1-2, 1937.—(Abstract by G A S).**

THE new business representatives of the three Los Angeles gas utilities, the Los Angeles Gas and Electric Corp., the Southern California Gas Co. and the Southern Counties Gas Co., last summer determined to repeat the successful clock-controlled gas range promotion of 1934, which had proved to be so desirable.



C. H. POTTER

Up to that time practically no progress had been made in promoting this new controlled cooking range. It was believed, however, that such a cooking appliance, besides offering new sales features and advantages, also gives to the industry a needed modernizing slant. A plan was worked out whereby the manufacturers, selling dealers and gas companies would participate in a 60-day sales promotion plan. A series of meetings was held with manufacturers and trade groups with the campaign dates set from February 1 to March 31, 1934.

During this period the participating outlets were enabled to sell clock-controlled gas ranges at the same prices as the same models without the clock feature. It was decided that a subsidy be paid to the stove manufacturer by the gas company upon whose lines a range was installed, such subsidy being set up to cover the manufacturer's "out of pocket" costs of the control device.

Since the subsidy was passed on to the dealer by the manufacturer, the retailer in turn was in a position to offer to the consuming public predetermined discounts on all clock controlled models, varying from $40.00 to $59.00. Furthermore the dealer received his normal margin of profit. Under this plan it was possible to advertise to the buying public definite savings on each range purchased, the top saving being $59.00.

During that 60-day campaign approximately 13,000 modern, clock-controlled ranges were sold and installed on the lines of the three serving companies, closing for many years to come 13,000 outlets on which competitors might elect to work.

During the summer of 1936 it was again determined to give our aggressive competitor something more to worry about. Following an analysis of sales campaigns ideas, it was finally determined that a good old Clock-Controlled Gas Range Promotion would probably be most effective. Meetings were again held with the dealers and down-town merchants,

Two EXCLUSIVE *Magic Chef Features*

THAT WILL MAKE IT EASY FOR YOU TO GET YOUR SHARE OF MODERN GAS RANGE SALES

● That all gas ranges are not alike is demonstrated convincingly by the new Magic Chef Series 2700, 3700 and 4700.

Outstanding among the revolutionary features that set these new ranges far in advance of any ranges on the market are the High-Speed Oven and the Swing-Out Broiler.

These two features are more than talking points. They are distinctive sales advantages so unbeatably powerful that they need only be demonstrated to win immediate consumer acceptance.

With the right kind of aggressive local activity behind these new series, gas companies can absolutely dominate gas range sales in their respective territories.

On these models work top and broiler grid furnished in Monel Metal at extra cost if desired.

SWING-OUT BROILER

The Swing-Out Broiler is an exclusive Magic Chef feature that makes broiling easier and more comfortable. By simply opening the door, the entire pan and grid with contents are swung out away from the hot zone of the broiler flame. Thus the turning of food can be comfortably and quickly accomplished without touching any part of the hot broiler. The broiler is at a convenient height so that the operator can stand comfortably erect without stooping. The specially designed broiler burner is entirely independent of the oven burner.

HIGH-SPEED OVEN

The Magic Chef High-Speed Oven introduces a new standard of oven performance. The construction is of a type which facilitates fast heating of the oven, equalizes heat distribution and produces greater efficiency. The oven burner operates on a new principle of staggered cross fires, by which the heat is greatly intensified.

LOW-TEMPERATURE COOKING

This burner, combined with the semi-direct action oven principle, makes it possible to greatly reduce the time of preheating—500 degrees in 7 to 8 minutes. On the other hand a minimum oven temperature as low as 225 degrees or less can be indefinitely maintained for slow cooking and canning.

AMERICAN STOVE COMPANY

BOSTON • NEW YORK • PHILADELPHIA • ATLANTA • CLEVELAND
LOS ANGELES • CHICAGO • ST. LOUIS • SAN FRANCISCO

LOOK FOR THE RED WHEEL WHEN YOU BUY A MAGIC CHEF

Magic Chef
AMERICAN STOVE COMPANY

with the range manufacturers, but no unanimity of opinion could be reached. Certain groups of outlets thought that the plan could not be repeated successfully — others believed that the glamour of the first campaign was lacking. The manufacturers generally agreed that it was worthy of a trial but were opposed to raising the base price from $89.50—the point at which the 1934 price had been pegged—to $109.50, the point which the gas companies recommended.

Finally an agreement was reached and the dates of the campaign set to run from September 21 to November 25, closing on Thanksgiving Eve. The inducement to the buyer was a price reduction on certain clock-controlled gas ranges equal to the manufacturers' established retail differential for the clock assembly.

Here again was a merchandising slant, a $30.00 saving and in certain cases more than $30.00 on the purchase of a late model clock-controlled gas range. Terms for the campaign were established with a $5.00 down payment (plus sales tax) minimum monthly payment of $5.00 with maximum term contracts not to exceed 21 months. Since previously selling and financing of ranges called for terms up to five years, it was thought by some that this was just one more reason why the campaign could not succeed.

But what was considered a successful campaign in the face of fall elections, introduction of Boulder Dam Power with its attendant ballyhoo and publicity, increased minimum price to $109.50 as compared with $89.50 in the former campaign, shortened terms, not to mention a lack of enthusiasm on the part of many dealers, manufacturers, as well as many among the three gas companies? Some guessed 5,000 units — others figured 7,500 and still others thought 10,000. More enthusiastic estimates varied from 15,000 to 20,000. One or two ventured 25,000.

One favorable factor during the second campaign was the assurance of a substantial supply of Grayson Clocks. A clock shortage seriously hampered the 1934 sales event.

The sale started promptly on schedule with September 21st witnessing a generous advertising response in the daily newspapers on the part of the downtown retailers. This, of course, was supported ably by hundreds of smaller metropolitan and suburban dealers throughout the territory.

The volume of sales during the first three or four days appeared to be large but by the end of a week, interest seemed to lag. Retailers as well as the gas companies authorized additional advertising space for the daily papers, but it seemed difficult to create any buying hysteria as was the case in the original campaign when there was a clock shortage.

Early in October, it was apparent that there were too many factors drawing the public's attention, including the Boulder Dam Power ballyhoo and the presidential campaign.

Due to the lag between actual sales and the reports received in the central clearing house, it was difficult to determine just how many clock ranges were being sold. The committee talked to manufacturers, downtown dealers and canvassed the district outlets in an endeavor to learn just what the sales score was. Actually about all that was determined was that most dealers were overstocked, manufacturers had surplus stocks in their warehouse and in addition to this uninviting situation, the Grayson Company had a surplus of clocks.

By the middle of October it was decided that something drastic should be done to put added sales momentum into the campaign. A committee of four representatives from the participating manufacturers, Messrs. George Satller, R. B. Hutchison, E. B. Hanmer and Hubert Tappan met, analysed all facts at hand, and decided to sponsor a radio program over two of the leading Southern California stations—KFI and KHJ. The program was underwritten by the ten range manufacturers, the Grayson Heat Control Co. and the three gas companies.

These radio programs went on the air October 25th and were continued every two or three days continuously up to and including November 18th. The broadcasts were known as "Carefree Minutes with a Clock-Controlled Gas Range"; were of 30 minutes duration, offered orchestration, dramatic tenors with supporting harmony, and comedy songs. Effective sales messages were worked into the programs and a sharp increase in sales was at once noticed throughout the territory.

Immediately following the November 7th election, added buying was evident among most outlets. Boulder Dam propaganda cooled off, and political speeches were no longer an hourly radio diet.

The holiday appeal was thrown into the range campaign; dealers were urged to canvass all prospects, and the final drive between November 10th and 25th, the last selling day of the promotion, almost approached the buying hysteria of the 1934 sale. Estimates were that probably 50 per cent of the total units sold during the entire campaign were purchased during the last 15 days of the sale, and much of this volume was attributed directly to the radio campaign, which cost approximately $5,000.00.

A recap of all dealer and company sales shows the total of actual units sold and installed as follows:

Dealer Sales	11,891
Southern California Gas Co.	463
Southern Counties Gas Co.	501
Units	12,855

Only 145 units short of the 13,000 goal! All modern, automatic Clock-Controlled Gas Ranges with installed prices—less the $30.000 clock assembly—varying from a low figure of $109.50 to a high of $210.50 on standard four burner ranges and a top of $257.50 on six burner models! Average net figure for all ranges was estimated at approximately $120.00, a splendid figure in a territory which but a few years ago had an average installed price of around $75.00 per unit.

A total of 16 range manufacturers and approximately 700 dealers participated in the campaign. This promotion was considered highly successful in view of the fact that it was a repetition of a former sales activity and particularly because it came at a time when many factors tended to retard sales efforts.

■ ■

H. A. Carpenter, Engineer, Dies in Calcutta, India

Henry Albert Carpenter, engineer and executive in the gas industry for many years, died suddenly March 6 in Calcutta, India. In 1907 Mr. Carpenter was elected president of Riter-Conley Manufacturing Co. of Pittsburgh. In 1909 he was made vice-president in charge of operations and he held this position until he retired in 1916. While with the company he established its gas engineering department covering the construction of gas holders and gas works throughout the country. He was a graduate of the Sheffield Scientific School of Yale University.

■ ■

Ruthrauff Succeeds Diggle In Gas Service Sales Post

Harold Ruthrauff, member of the new business department of The Gas Service Co., Kansas City, Mo., since 1925, has been promoted from the department at Independence, Mo., to supervisor of the department of The Wyandotte County Gas Co. in Kansas City, Kan. He succeeds Harold Diggle, who has resigned because of ill health.

Mr. Ruthrauff joined The Gas Service Co. as a floor salesman of the Newton Gas Co., Newton, Kan.

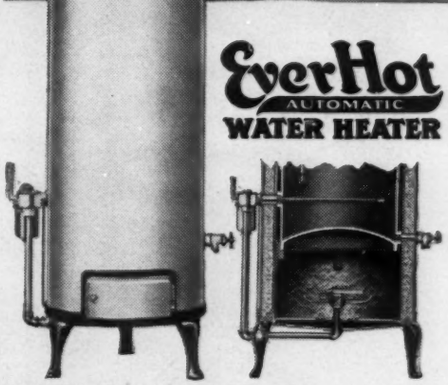
When you recommend EVERDUR* METAL

1. The public gets:
Clean, rust-free hot water indefinitely. Complete freedom from rust expense. Longer service and greater value.

2. The utility gets:
Steadier gas consumption. Freedom from constant servicing. More satisfied customers and friends for gas.

OUR consistent national advertising of EVERDUR Metal for tanks helps keep the public "hot water conscious"... develops customers for the hot water equipment which you want used. At the same time we are educating the public to buy equipment which will give top-notch service and long-run economy. This durability of Everdur Tanks is also a worthwhile consideration when utilities are promoting heater sales on deferred payment plans.

More than fifty leading makers of household water heating equipment standardize on EVERDUR Metal for non-rust tanks. Recommend to your customers that they safeguard their automatic water heater investment with a storage tank that will *never rust!*



"EverHot" Junior automatic gas water heater, made by the EverHot Heater Company, Detroit, Mich., is offered with all-welded tank of non-rust EVERDUR Metal

• • •

Cutaway view shows partial construction detail.

37154

ANACONDA
from mine to customer

Everdur Metal

RUSTLESS AS COPPER
STRONG AS STEEL

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT

Offices and Agencies in Principal Cities • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

*EVERDUR is a trade-mark of The American Brass Company, registered in the United States Patent Office.

Announcing a New

Remote Control for space heaters by WILCOLATOR

Simple to install—Easy to adjust—and priced so low that it may be merchandised with even the smallest space heaters

THE Type V Wilcolator room thermostat operates on an entirely new principle for controlling a diaphragm valve—a sound principle—with no gland pins, packed valve stems and other causes of troublesome service calls. Universally applicable to all types of gases.

Adjustable bleed to compensate for varying distance between thermostat and diaphragm valve. This feature provides for unusual installations—where other types have failed.

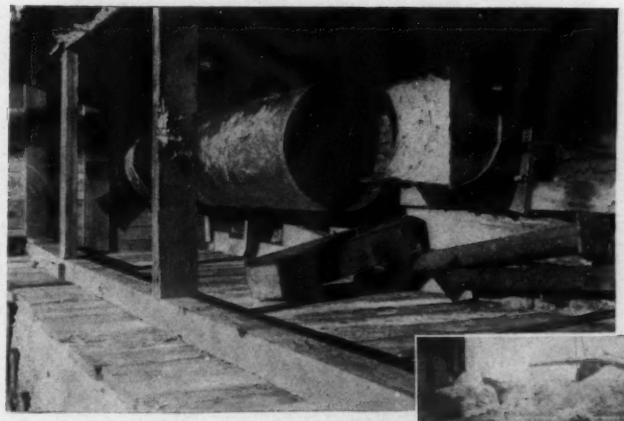
Simplicity of construction and absence of wearing and friction producing parts results in a sensitivity equivalent to electric operation—a sensitivity maintained throughout the life of the thermostat.

The Type V room thermostat is provided with a by-pass adjustment for conventional high-low operation—the accepted safe and economical method. Quick-acting operation provides full gas supply until desired room temperature is reached.

The capacity of this unit is amply sufficient for the largest space heaters. Pressure drop through the valve is so low that even under very low gas pressures good operation is insured.

See this unit in operation at Natural Gas Convention, Kansas City—Booth 203—or write us for descriptive literature.

THE WILCOLATOR COMPANY
NEWARK • NEW JERSEY



A DIVER (below) lowers the 20-inch industrial gas line to the proper grade on the bottom of Indiana Harbor Ship Canal.

ABOVE IS seen the casing as it protrudes from under the railway right-of-way. Note the bucket used to remove the dirt while the casing was being jacked through the grade. The pipe was laid between Burnham, Ill., and Gary, Ind.

Jacking Methods Employed in Laying Transmission Line in Chicago Area

By J. C. ALBRIGHT

Staff Correspondent

ONE of the most difficult pipe line construction jobs in the Chicago industrial area was undertaken by the Williams Brothers Corp., Tulsa, Okla., in June of last year. This pipe line, designed to handle natural gas, was begun in Burnham, Ill., and extended 9.7 miles from that suburb to Gary, Ind. Along the pipe line survey, 97 railway tracks were located, as well as 46 paved city streets, all of which had to be crossed by excavating and by jacking conductor pipe, or casing, through the railroad fills. Construction of the line was completed on October 31.

This transmission line was constructed on the Illinois side of the state line for the Chicago District Pipe Line Co., and on the Indiana side for the Indiana Natural Gas & Oil Co. The pipe was furnished to the contracting company in 80-foot joints, weighing 52 lbs. per foot and wrapped at the mill before shipping. The pipe used for the canal crossing was also 20-inch, but weighing 79 lbs. per foot, both being furnished by National Tube Co. Due to the length of the joints, three flat cars were required to haul one carload of pipe, one to carry the load and the other two, one at each end of the loaded car, to protect the overhang.

The major portion of the line was laid beside the right-of-way of the Baltimore & Ohio, the Chicago Terminal, and the Elgin & Joliet Eastern railroads, which made it comparatively easy to string the pipe directly from the loaded cars. Two cranes were used to string the 80-foot joints, one being located on each of the empty cars so that the booms could work in unison as the pipe was lowered to the ground. A locomotive was used to push the cars slowly down the tracks so that the cranes were not idle until another loaded car was required.

At the state line between Illinois and Indiana, five separate railroads traverse an area 330 feet wide across which this 20-inch line had to pass by being laid beneath all the tracks without tunneling. If tunneling had been permitted, the job of laying the line beneath the tracks would have been easy, but casing was required for the pipe. For this job, 32-inch casing, or pipe line conductor, was jacked the entire 330 feet by pushing it through the ground. Requirement of the pipe line called for a constant grade and no deviation from the survey, consequently the casing had to enter at an exact point and emerge at a stake on the other side of the five tracks.

Jacking Operation

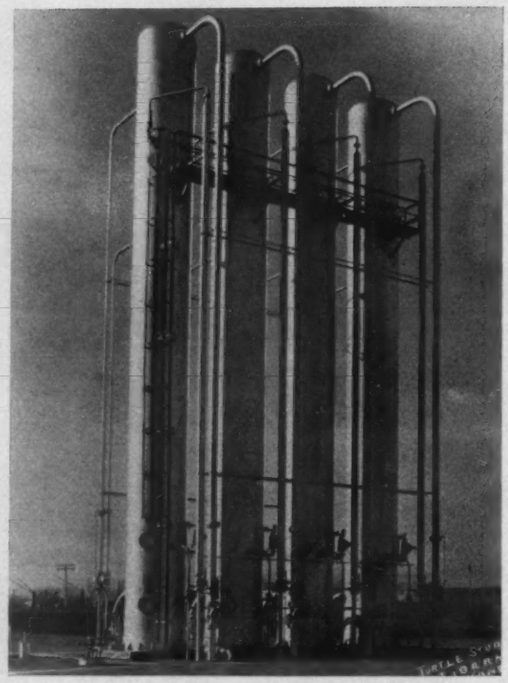
Considerable engineering skill was required to place the casing underground, and an engineer was stationed at the jacking station with a transit to constantly check the movement of the pipe. The pipe used for casing beneath these tracks was beveled on the end, entering the soil to provide a wedge-shaped cutting edge so that a part of the ground would be compressed against the outer surface as it was jacked through the railroad fills. Jacks, placed stationary, were used to push the casing through the soil. Blocks were used to take up the distance from the jack heads to the pipe as it was pushed through the ground. Dirt which would normally fill the pipe as it was pushed along was removed constantly by an employee working inside the casing, who also steered the pipe on its course. A scoop-shaped bucket was employed to remove the cuttings, having a wire line attached to both front and back, one to pull the filled scoop out of the pipe for dumping, and the other for the man inside to drag it back to him again. If any obstruction in the ground had a tendency to force the end of the pipe off the course, it was removed to prevent unequal pressure on the cutting edge of the casing.

All of the additional 91 railroad crossings were made by the same method as that employed while jacking the casing beneath the five-track right-of-way. Some of these ran at an angle; others directly across. Where the pipe was laid in a ditch beside the track, wood cribbing was installed to prevent sloughing of the ground which would interfere with the stability of the railroad roadbed. Approximately two car loads of dimension lumber were used for cribbing the ditch.

The major portion of the 9.7 miles of pipe line survey crossed ground which was underlaid with shallow water which would have caused extreme difficulty in opening the ditch, if it had not been removed ahead of the ditching machines. Well points were sunk into the soil to a predetermined depth, after opening the soil

(Turn to Page 64)

+ *Greetings*
to the
Natural Gas Men
of A. G. A. at the
Kansas City Convention



BANK OF FOUR COMBINED ABSORBERS and DEHYDRATOR CONTACTORS at the PANHANDLE EASTERN absorption plant, LIBERAL, KANSAS

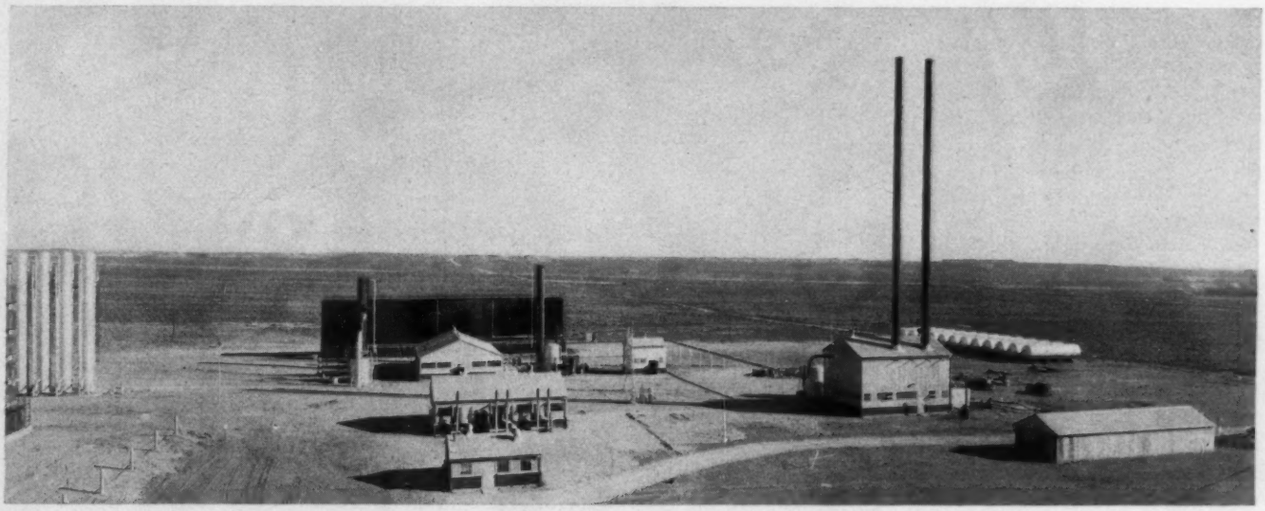
PARKHILL-WADE, Inc.

AN OUTSTANDING ACHIEVEMENT FOR THE PANHANDLE EASTERN PIPE LINE COMPANY AT

LIBERAL
KANSAS

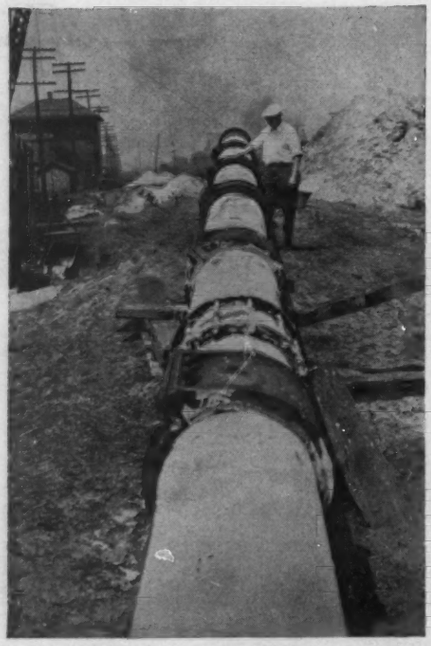
AFFILIATED with
The Stearns-Roger Manufacturing Co.
in the design and construction of . .

GAS DEHYDRATION UNITS with CALCIUM CHLORIDE, GLYCERINE or DIETHYLENE GLYCOL CYCLES • • • • • •
NATURAL GASOLINE PLANTS • DUST and LIQUID SCRUBBERS • STABILIZATION PLANTS
BUTANE PRODUCTION UNITS • BUTANE STORAGE and HANDLING EQUIPMENT



Absorption and dehydration unit designed to handle 135 MM cubic feet per 24 hours at 450 pounds gauge, with designed ultimate at 200 MM, recently put into operation for the Panhandle Eastern Pipe Line Company at Liberal, Kansas.

PARKHILL - WADE , INC.
CONSULTING AND CONSTRUCTION ENGINEERS
973 NORTH MAIN STREET
LOS ANGELES



The river crossing at Indiana Harbor was made with 20-inch, 79-pound National pipe with 600-pound river clamps and Dresser sleeves over each weld.

with a stream of water from a joint of 2-inch pipe. The sand points, or well points, were placed at varying intervals, depending upon the amount of water in the ground and the difficulty in removing it. The unwatering contractor set a continuous row of well points ahead of the ditching crew and had the soil comparatively dry as the ditch was opened. Each point was connected by a hose to a common pipe line, which in turn was connected to portable pumps which removed the water and pumped it into storm sewers, when crossing the residential section, or dumped it upon the ground in the open country. After the pipe line had been laid and backfilled, the points were removed from the ground and used again ahead of the ones set for the ditching crew.

Across some of the outlying districts, the pipe line passed over swampy land. Pipe which was laid in the ditch at these points was required to be held down with pipe line anchors, two of which were used, one on each side of the pipe. Screw type anchors were installed, at first by hand but later the contractor devised a machine for setting the anchors in the ground.

Another difficult crossing stood in the way of the pipe line when the crews reached the Indiana Harbor Ship Canal, which was 300 feet wide at the point of crossing. Drag line buckets were used to dredge the ditch in the floor of the canal, moving the sand, muck and debris from the bottom to the bank on either side. Because of the current, and the shifting properties of the sand and mud, large amounts of materials were taken from the canal before a ditch sufficiently deep had been made. Pipe for crossing this canal was 20 inches in diameter, and had a weight of 79 lbs. per foot. The crossing section was made up by welding each joint before pulling the section into the canal. A large number of river clamps were required, made of cast iron and weighing 600 lbs. each. Also, each welded joint was further protected by a Style 40 Dresser coupling which was placed over the welded seam before the line was dragged into the water.

After the ditch had been cleaned to the proper depth, the crossing section was placed in position, but Government engineers, who had charge of inspecting the canal crossing, found that the pipe did not rest on the bottom sufficiently deep to meet conditions imposed upon the contractor. Consequently, a diver was employed to inspect the sandy bottom to determine where the pipe needed lowering, and to remove silt when necessary.

When turns were required in laying the line, "wrinkle bellies," manufactured by A. O. Smith Corp., were used instead of pipe bends. At these places, angles and turns the pipe was blocked with concrete made with a mix of 1:3:6 to retain the line and prevent creeping. While turns and bends were permitted, sags or uneven laying of the pipe were not. Consequently, except when crossing the ship canal, the line lies on a constant grade, the purpose of which was to prevent collection of moisture and liquids which would prevent free movement of gas.

Canal Crossing

Bare pipe used on the line, and coated pipe which had the mill protection scarred or peeled, was protected by using No-ox-id 'GG' primer coat, hand applied after the pipe had been brushed and wiped clear of all soil and other foreign material. The wrap was impregnated with No-ox-id and a final service coat was applied before the pipe was covered with dirt. Casing ends were sealed to the pipe line to prevent the introduction of moisture, with adequate vents provided at each end. Inside the casing, shoes were used to support the pipe from the lower side of the casing. They were inserted at intervals to support the pipe on the required constant grade, and to maintain the required annular space between the pipe and the casing.

Even with all the adverse conditions which the contractor was forced to contend with, the pipe line was completed on schedule with no property damage, and no employee injuries, excepting contusions and skin abrasions. Under a 10 day test, the pressure applied indicated that the line was gas tight and no leaks were discovered.

Equitable Gas Announces Promotions

H. H. PIGOTT

J. M. SHIELDS

HARLAN H. PIGOTT is the new general superintendent of production and transportation of the Equitable Gas Co., the Pittsburgh and West Virginia Gas Co., and the Philadelphia Oil Co. The appointment was effective March 1. The post he fills has been vacant for some time.

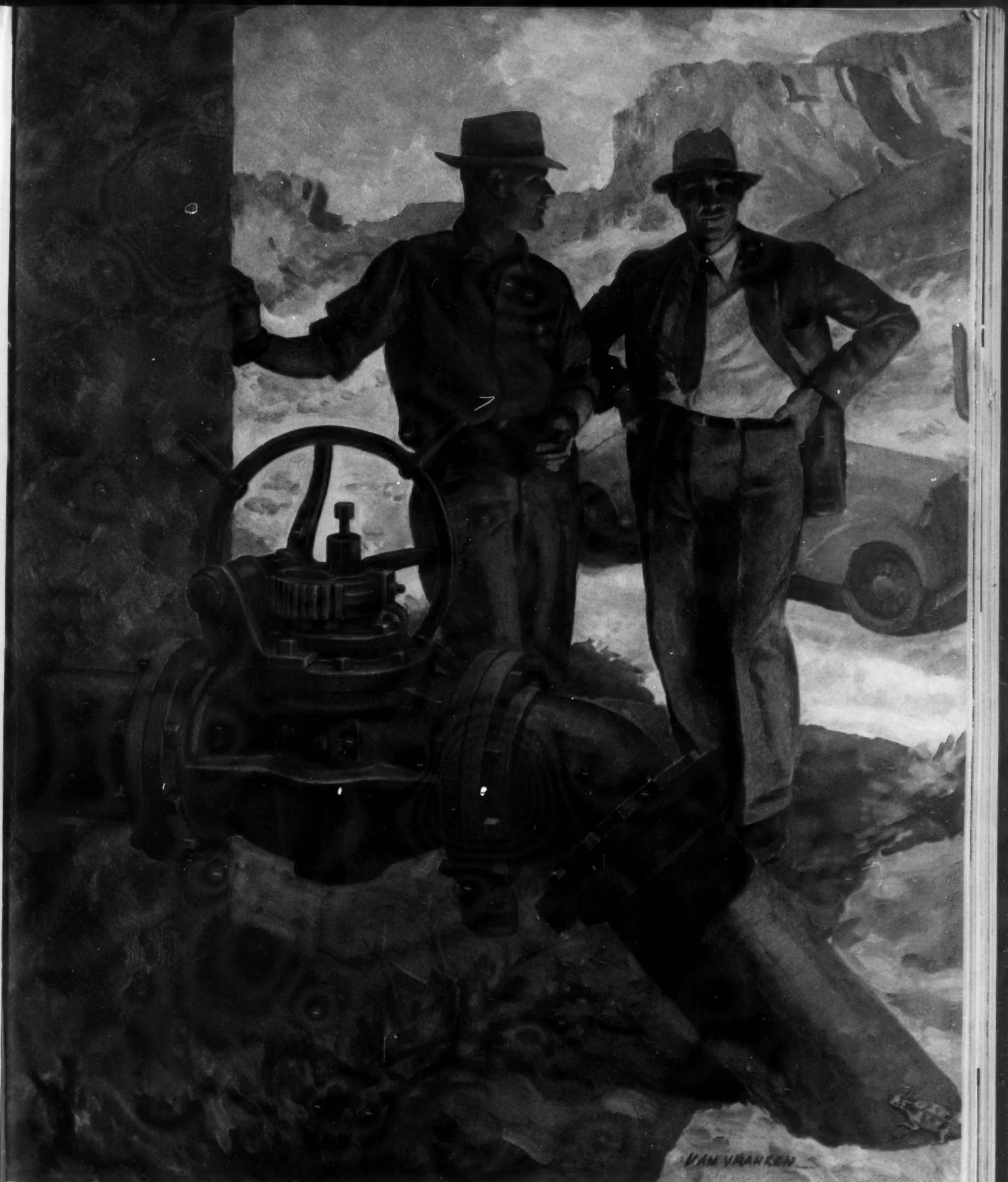
Mr. Pigott has been land agent for the Equitable Gas Co., Pittsburgh, Pa., for more than a year and has been with the utility for ten years, joining the staff as field agent in the land department. In 1931, he was made assistant land agent. In earlier years he was associated with companies operating in the Kansas, Oklahoma, and Texas oil fields, and with the Muskingum Oil and Gas Co., Marietta, Ohio.

J. M. Shields, field agent in the land department of the Equitable Gas Co., has been promoted to the position of land agent, formerly held by Mr. Pigott. Mr. Shields was in leasing work in Oklahoma, then was with the Gulf Refining Co., and next with the Stevens Oil Corp. in charge of drilling and production, before he joined the Equitable Gas Co. as field agent in 1924. For five years he was the company's field agent in Green County, Pa.

■ ■

New Kansas City Franchise

A new franchise, substantially the same as that which just expired, has been granted to the Kansas City Gas Co., Kansas City, Mo., by the Kansas City council.



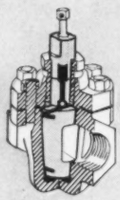
"Can you really 'get by' with only one valve 'way out here?"
"Sure; one's enough for positive shut-off, Chief. It's a Nordstrom."

THE PERFECT APPLICATION OF A PRINCIPLE

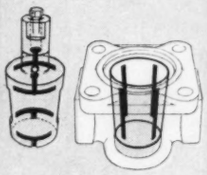
Study this picturized demonstration

OF A

NORDSTROM VALVE

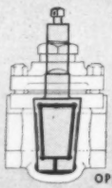


1 Cut-away view of 3" Nordstrom Valve, to reveal lubricated plug in position.

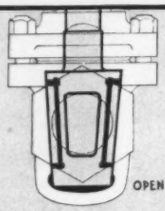


2 Simplified view, same valve, with plug lifted out, showing lubricant grooves in plug and body.

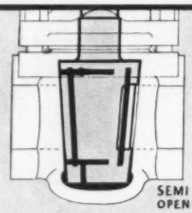
3 Hydraulic pressure forces plastic lubricant through plug channels to outer, upper grooves by turning screw.



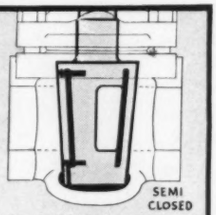
4 Grooves in plug connect with grooves in body, making circuit for lubricant to reach bottom plug grooves and maintain pressure.



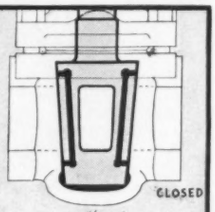
5 Port side of valve (valve open) with plug in same position as figure 4. Note the unbroken pressure circuit.



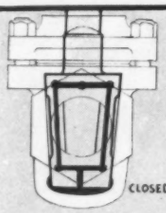
6 When plug turns to shut off valve, lubricant pressure is cut off from vertical groove in body **exposed** to plug port.



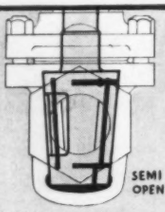
7 As plug turns, the lubricant pressure circuit is unbroken because vertical groove **unexposed** to plug port connects top and bottom grooves.



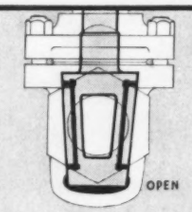
8 Plug is now at 90° turn, completely shutting off valve. Vertical groove exposed to plug port re-joins horizontal grooves of plug



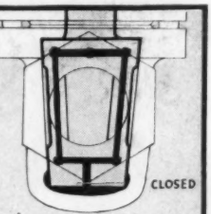
9 View of valve, port side Pressure lubricant grooves form a continuous seal around the closed valve port.



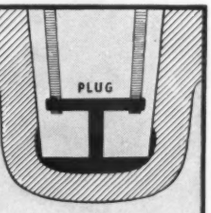
10 Reversing the operation to turn on valve. Vertical body groove exposed to plug port is relieved of pressure because the plug grooves break the circuit.



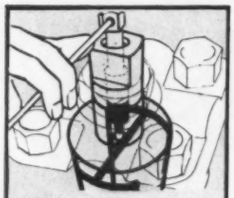
11 Valve in full open position presents unrestricted passage of line contents, but lubricant seal protects surface of plug



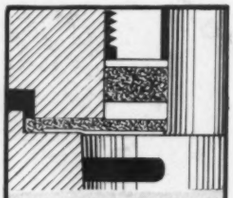
12 When valve is closed, ring of pressure lubricant effectively seals the entire port of the valve



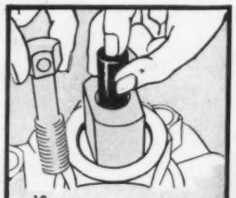
13 Under plug, a lubricant chamber forms hydraulic lifting means, to lift tapered plug from its seat.



14 Assume valve is stuck. Operator simply turns screw. This increases pressure on lubricant through grooves and to bottom chamber which lifts plug sufficiently to free it.



15 No long stuffing box needed. Packing is frictionless, unexposed. Positive seal formed by metal diaphragm.



16
NORDSTROM Lubricant in plastic stick form is inserted. Specially compounded for specific temperature and chemical conditions.

ONLY

NORDSTROMS

meet every major valve need

Ask for Catalog

MERCO NORDSTROM VALVE CO.

A Subsidiary of

PITTSBURGH EQUITABLE METER CO.

Main Offices: Pittsburgh, Pa. • Branch Offices: New York City, Buffalo, Philadelphia, Columbus, Memphis, Atlanta, Chicago, Kansas City, Tulsa, Houston, Los Angeles, Oakland. • Canadian Representatives and Licensees: Pocock Brothers, Ltd., University Tower Bldg., Montreal, Quebec

NORDSTROM VALVES

LUBRICATED PLUG

PATENTED "SEALOPORT" LUBRICATION

Many Inventions Bring P. C. G. A. Medal of Honor to John H. Grayson

RANKING the development of gas heat control devices among the most important advances of the twentieth century, Addison B. Day, president and general manager of the Los Angeles Gas and Electric Corp., Los Angeles, Calif., on April 2 conferred the Pacific Coast gas industry's medal of honor upon John H. Grayson, inventor of Lynwood, Calif. The medal was presented at a luncheon on the second day of the Spring Sales and Advertising Conference of the Pacific Coast Gas Association, held in the building of the Los Angeles utility.

Mr. Grayson is the inventor of the Grayson snap-action thermostat, safety pilot light, automatic clock control, and low temperature burner control.

The Addison B. Day Medal of Honor is the highest award made by the Pacific Coast Gas Association for distinguished service to the industry. Only twice before has the board of directors considered one individual's contribution great enough to warrant bestowal of the medal, Mr. Day said in his presentation speech.

Mr. Grayson is considered one of the nation's leading authorities on gas combustion. Trained from boyhood in the machinist and tool makers trade, he became identified with the gas industry at the close of the World War when he took up the study of combustion problems in the Bureau of Mines and the Bureau of Standards. His work in this field was so outstanding that his services were sought by the gas industry, and he began a series of lectures throughout the United States.

ADDISON B. DAY, Los Angeles Gas and Electric Corp. president, (left) congratulates JOHN H. GRAYSON, inventor, on being awarded the Pacific Coast Gas Association medal of honor.

In 1927 he invented a snap action thermostat for gas water heaters, and, coming to Los Angeles, he founded the Grayson Heat Control, Ltd., at Lynwood, to manufacture the device. Later he developed other heat control inventions.

Perhaps his most noteworthy achievement is the perfection of an automatic clock control for gas ranges, by which the gas may be turned on and off at predetermined times automatically. This device reduces the labor of cooking to a minimum, and has become practically standard equipment on the modern gas range.

Although Grayson Heat Control, Ltd., has been acquired by the Reynolds Metals Co., of New York, Mr. Grayson remains closely associated with the industry, having established a research laboratory at Lynwood for the purpose of further experimental work in gas heat control.

■ ■

Cities Service Co. to Spend $7,000,000 on 1937 Expansion

A total of $7,000,000 for improvements and expansion during 1937 has been allotted to the natural gas subsidiaries of Cities Service Co., according to a press announcement in New York City.

The appropriation will be used to buy leases, drill offset and test wells, construct pipe line, and develop underground storage facilities.

Cities Service gas subsidiaries, which form one of the largest natural gas groups in the world, added more than 300 miles of pipe line during 1936. Notable among the extensions was the 131-mile 8- and 10-inch pipe line which connects the Harrison pool in northern Pennsylvania with the Dunkirk and Batavia distribution systems in New York. Purchase of the 82-mile 10-inch line from the Richland-Monroe fields in Louisiana to El Dorado, Ark., was also arranged.

■ ■

Llano Grants Franchise To Public Service Corp. of Texas

Public Service Corp. of Texas, Fort Worth, has been granted a franchise to serve natural gas in the town of Llano, and plans have been formulated, according to Thomas Cook, vice-president of the corporation, for the laying of a pipe line from the Hamilton County gas field to bring gas to the towns of Llano, San Saba, Goldthwaite, Lometa, and Lampasas, providing a survey now being conducted indicates sufficient probable consumption to justify the line.

A franchise has already been approved by the city council of the town of San Saba. The Llano franchise is conditional upon 30 days acceptance by the corporation.

Pacific Gas and Electric Co. meets a gas service installaton problem by boring beneath pavement.

P. G. and E. Meets Service Problem in Rapid Manner

During the present rush toward early completion of the famous Golden Gate Bridge, San Francisco, Calif., a problem of installing a gas service connection across the north approach to the bridge was met in an interesting manner by the Pacific Gas & Electric Co.

Heavy trucking of bridge supplies over the approach made traffic interruption out of the question. Detouring was also impossible, for no other roads could be built on the narrow strip of land between the ocean and foothills.

The utility company dispatched one of its Hydrauger-equipped service trucks from a nearby city and bored across beneath the pavement. The distance of 36 feet was penetrated in 28 minutes after the boring commenced.

The bore was directed by means of sighting targets to enter a concrete service box but 14 inches wide. The pilot bit of the machine entered the box almost at its exact center.

■ ■

Lone Star Builds New Bridge Over Brazos for 16-Inch Pipe

Replacing the pipe line bridge across the Brazos River at Waco, Texas, which was swept away by floods last September, Lone Star Gas Co. has just completed a span larger and higher than the former bridge. The 16-inch pipe line is suspended 20 feet above the record high water mark of the floods last fall.

The new bridge is 1054 feet long overall, 305 feet longer than the old bridge. The new towers are 65 feet above pier levels, or 25 feet higher than the previous towers. The new piers are 66 feet high.

Laying of the new pipe line after completion of the bridge was supervised by Eldon Glenn, foreman of the Waco district of the Lone Star Gas Co. pipe department.

More Power FOR YOU IN

1

MIRACLE OF SILENT FREEZING

BRINGS OWNERS BIG SAVINGS

All over the world **SERVEL ELECTROLUX** *is providing safe refrigeration ...for more years at low cost...because its freezing system*

HAS NO MOVING PARTS

Here's the secret of this different, noise-free operation, which offers you exclusive advantages

THROUGHOUT its long life, Servel Electrolux serves you in almost! And that is far more than just a comfort. It means continued savings, as millions have proved.

For permanent silence is the outward sign of a basically different refrigerating principle that has no moving parts—and needs none! A tiny gas flame does all the work in Servel Electrolux. It circulates the refrigerant which keeps your food fresh for days and adds to your pleasure with sparkling cubes of ice and delicious frozen desserts.

By this simpler, noiseless way of producing cold, Servel Electrolux is set apart from every other refrigerator, bringing you important benefits no other can match. It assures longer, more satisfying performance—a practical absence of upkeep expense—the same low operating cost year after year.

For remember, parts that do not move cannot wear and become inefficient, causing costly repair bills, or increase the daily cost of operation.

Remember, too, the great American gas industry has united Servel Electrolux for you. Your local gas company backs and services every one it installs.

See the beautiful 1937 models at any gas company or dealer showroom. Learn how easy it is to own this modern gas refrigerator on a convenient purchase plan. Owners have figured out that Servel Electrolux pays for itself with the money it saves—in a remarkably short time.

For farm and country homes
It runs on kerosene or bottled gas

You can still enjoy the convenience and savings of a Servel Electrolux, though you live miles from the gas mains. Write for details. Servel, Inc., Evansville, Ind. (Servel Electrolux is also sold in Canada and Central and South America.)

* * *

TUNE IN "THE MARCH OF TIME"—Columbia Network—Thursday evenings, 10:30 E.D.T. Sponsored by the makers of Servel Electrolux Refrigerators.

2

Movie Stars and Savages Attracted to the Flame that Freezes

What Happens When A Hollywood Sophisticate Or A Wild Borneo Native Discovers Ice Being Made From Heat, And How They React To This Amazing Method Of Producing Cold Without Machinery Or Moving Parts.

3

Silent for all time

SERVEL ELECTROLUX
IS SILENT AND DIFFERENT

because its freezing system has no moving parts!

It gives you longer, more satisfying service and money-savings

All automatic refrigerators *look* pretty much alike. But your own ears will tell you that Servel Electrolux is basically *unlike* any other. It operates without ever making a noise!

And this is a tremendous advantage in itself! But even more important is the cause of this permanent silence . . . a different, simpler way of producing cold and cubes of ice, which saves you money year after year.

Servel Electrolux has no moving parts in its entire freezing system . . . and needs none! A tiny gas flame circulates the refrigerant—without friction or wear, without loss of efficiency due to moving, wearing parts.

As a result, you enjoy more years of perfect, trouble-free refrigeration with a Servel Electrolux. And you enjoy, as well, an amazingly low operating cost throughout its long life . . . a practical absence of upkeep expense and depreciation . . . convinced economists on food bills and leftovers. Owners find that Servel Electrolux saves enough to pay for itself in a remarkably short time.

Today, in all parts of America, even the earliest Servel Electrolux models—models which are now from 5 to 10 years old—are still serving faithfully . . . are still providing the same dependable, low-cost refrigeration as they did when new. They offer constant proof of the lasting benefits of refrigeration without moving parts.

See the beautiful 1937 models at your gas company or local dealer's showrooms. Get all the facts about this modern refrigerator that millions enjoy. Discover how easy it is to own one on a convenient purchase plan. Remember, Servel Electrolux has been tested and endorsed by the great American gas industry. Your own gas company offers prompt, willing service on every one it installs.

For farm and country homes
It runs on kerosene or bottled gas

All the advantages and savings that Servel Electrolux brings to city homes can be yours . . . no matter how far you live from the gas mains. Write for details to Servel, Inc., Evansville, Ind. (Servel Electrolux is also sold in Canada, and in Central and South America.)

* * *

TUNE IN "THE MARCH OF TIME"—Columbia Network—Thursday evenings, 10:30 E.D.T. Sponsored by the makers of Servel Electrolux Refrigerators.

SERVEL ELECTROLUX
THE *Gas* REFRIGERATOR

N YOUR SPRING SALES DRIVE

HERE ARE THE LATEST ADVERTISEMENTS IN THE GREAT 3-WAY SERVEL ELECTROLUX CAMPAIGN. THEY'RE TELLING YOUR CUSTOMERS . . . SELLING YOUR CUSTOMERS . . . *THE ADVANTAGES OF GAS AND GAS REFRIGERATION*

THE BIG SELLING SEASON IS ON. Servel Electrolux' advertising program—the largest ever run on *any* gas appliance—is in full swing, blanketing your territory with hard-hitting sales messages. More than 23,000,000 people a month are reading about gas refrigeration! Other millions are hearing about Servel Electrolux through radio's greatest dramatic show—"The March of Time."

Are you making the most of this powerful promotion?

Have you organized for an intensive drive on your entire community?

Here are some fundamental steps that will help you build record-breaking business during the current A. G. A. campaign:

(1) Display new Servel Electrolux models prominently in your windows and on the floor of your showroom,
(2) Send out literature about this different refrigerator,
(3) Tie in with Servel Electrolux' magazine campaigns by advertising in your local papers,
(4) Put up poster displays on your local highways, and
(5) Utilize the backs of gas bills for "reminder" advertisements.

REMEMBER—Servel Electrolux sales mean *permanent benefit!* This modern, popular refrigerator not only adds to the total gas load. It also creates valuable goodwill and, by giving a daily demonstration of the efficiency of gas and gas service, helps to promote the sale of many other appliances.

Servel, Inc., Servel Electrolux Refrigerator Sales Division, Evansville, Indiana.

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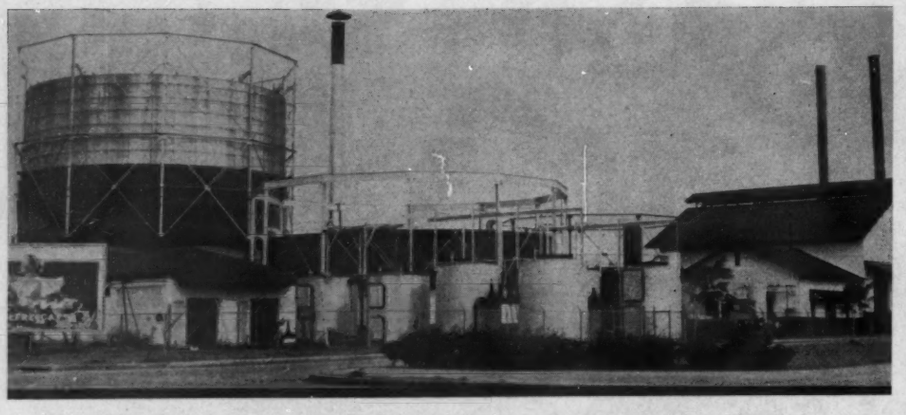
1 Here is another advertisement in the exciting tabloid series. Carrying the headline, **"MIRACLE OF SILENT FREEZING BRINGS OWNERS BIG SAVINGS,"** it contains many interesting pictures showing how Servel Electrolux is giving efficient service the world over. This advertisement will be run during May in "Collier's," "Liberty," "Good Housekeeping," "True Story," "American Magazine," "Better Homes and Gardens," and "American Home," with a total reader circulation of 13,458,679.

2 **"SILENT FOR ALL TIME"**—that's the headline for the May advertisement in Servel Electrolux' prestige campaign. This advertisement is running as a two-page spread in "The Saturday Evening Post" and a single page in "Time"—reaching 3,584,994 readers in all. A striking illustration combines with straightforward copy to tell an impressive story.

3 **"MOVIE STARS AND SAVAGES ATTRACTED TO THE FLAME THAT FREEZES."** With that arresting headline, the May advertisement in the "American Weekly" series continues its dramatic story of gas refrigeration. The top part of the advertisement drives home the essential difference of the Servel Electrolux refrigerator in an editorial manner. At the bottom of the page is a powerful, aggressive smash in color. This advertisement will reach more than 6,000,000 homes from coast to coast.

SERVEL ELECTROLUX
THE *Gas* REFRIGERATOR



Plant of the Compania Panamena De Fuerza y Luz at Colon, Panama, subsidiary of Electric Bond & Share. The company has two gas plants—this one in Colon and another in Panama City. The latter uses California oil, and the former, South American or Mexican oil.

Subsidary of Electric Bond & Share Co. Serves 5600 Meters in Panama Area

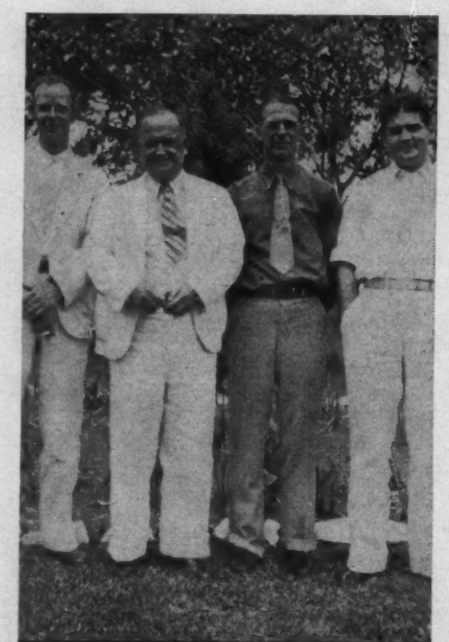
GAS for distribution in Panama is manufactured from crude oil; it is made in two plants—one on the Atlantic and one on the Pacific side of the Isthmus—belonging to the Compania Panamena De Fuerza Y Luz; consumption increased so greatly during the past winter that the company is considering an expansion program for the west coast plant.

These are some of the high lights of notes made for GAS by K. C. Tomlinson, Pacific Coast manager, The American Meter Co., during a recent vacation trip through Panama.

The Compania Panamena De Fuerza Y Luz is a subsidiary of the Electric Bond and Share Co. of New York. C. F. McMurray is vice-president and general manager in charge. R. E. Cole, formerly superintendent of distribution for The Montana Power Co., is general superintendent of the Gas Department, with headquarters in Panama City. G. W. Winquist is chief engineer. He devotes most of his activities to the steam plant and electrical operations of the company, leaving the gas properties freely in Mr. Cole's hands.

The company has one gas plant in Panama City and one in Colon. Both manufacture oil gas from crude oil. The plant at Panama City, on the Pacific Coast, uses California oil. Because of the high Canal rate, the plant at Colon, on the Atlantic Coast, uses South American or Mexican oil. The Colon plant on this account has difficulty with sulphur.

The Panama district includes the city of Panama, Ancon, the Canal Zone Settlement, and the Port of Balboa. The superintendent is K. L. Crapeau, a graduate of Purdue University and formerly from Lafayette, Ind. Mr. Crapeau's assistant is Bey M. Arosemena, son of the former president of the Republic of Panama. The territory served on the Pacific side of the Isthmus has a population of approximately 100,000. The city of Panama itself has a population of approximately 75,000. There are 3,400 active meters in the territory served by the Panama plant and the oil gas is of a 540 B.t.u. per cu. ft. heat value.



PANAMA PERSONALITIES. (Left to right) W. A. Kohlhoff, Superintendent of Gas in Colon, Panama; R. E. Cole, Superintendent for the two canal zone plants; K. L. Crapeau, Superintendent of Gas at Panama City, and B. M. Arosemena, son of the former President of the Republic of Panama, Assistant Superintendent at Panama City.

Gas rates are from $1.00 for the first 625 cu. ft. to as low as 95 cents per M c.f. for any excess over 750,000 cu. ft.

The maximum peak demand is 70,000 cu. ft. per hour and the minimum is 20,000 cu. ft. Sixty per cent of the gas supplied in Panama is sold to the Government, including the Canal Zone and Army and Navy Posts.

The Colon plant on the Atlantic side serves a territory of about 50,000 population and there are 2,200 active meters. W. A. Kohlhoff is superintendent of gas in this territory. He was formerly superintendent of utilization for The Montana Power Co. at Butte, Mont., and before his affiliation with the Montana company, was connected with the North Bay Division of the Pacific Gas and Electric Co. at San Rafael, Calif. Mr. Kohlhoff took charge approximately 18 months ago and since then has put the plant in excellent condition.

The gas department of the Compania Panamena De Fuerza Y Luz has enjoyed a notable development and new customers are being added continuously. An expansion program is under consideration for the plant facilities in Panama City.

■ ■

Pennsylvania Co.'s Announce Personnel Changes

Howard C. Snider has been appointed manager of the Pottsville Gas Co., Pottsville, Pa., according to announcement by Ralph H. Fry, division manager of the Citizens Gas Co., Stroudsburg, Pa. Mr. Snider formerly was chief clerk in the office of the Roanoke Gas Light Co., Roanoke, Va. D. R. Goodin, former Pottsville manager, has been transferred to Durham, N. C.

H. K. Dotter has been transferred from the Jersey Shore Gas Co., Jersey Shore, Pa., to the position of manager of the Bangor Gas Co., Bangor, Pa. W. H. Rorabaugh has been appointed manager of the Jersey Shore Gas Co. He formerly was distribution superintendent.

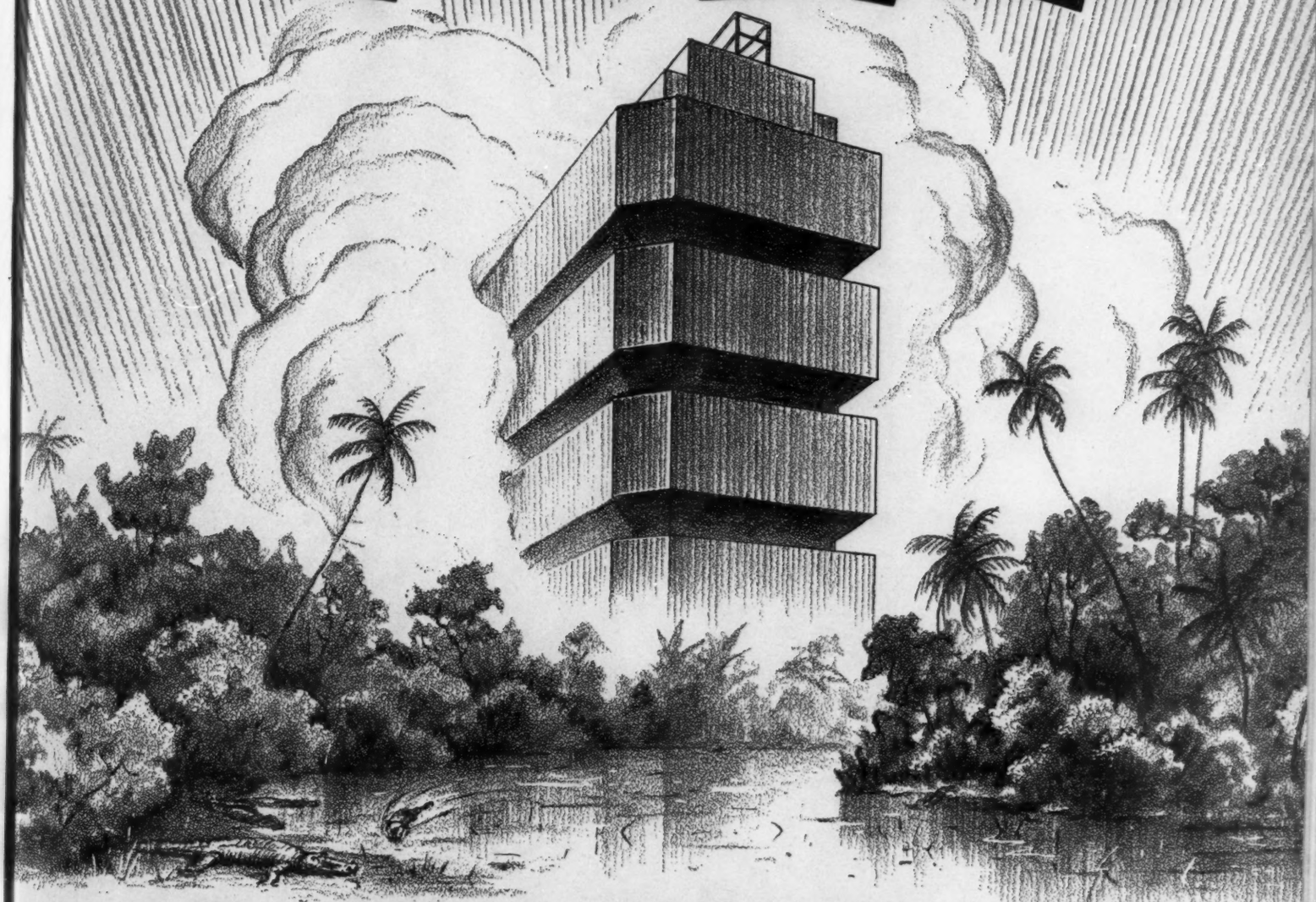
■ ■

Gas Service Contest Won By Range in Use for 60 Years

A 60-year-old gas range still in constant use won the Old Range contest conducted by The Gas Service Co., Kansas City, Mo. The range, a Sunflower, was purchased by Mrs. Lizzie Lemmon in 1877. During the 60 years she has used it, Mrs. Lemmon stated that she had spent only $5 for repairs. As winner of the contest she received a modern Detroit Jewel gas range.

A stove 54 years old won second prize, a cash award of $20. Three 50-year-old ranges tied for third place. The owner of each received $10.

SENTENCED



TO LIFE IN THE TROPICS!

Under scorching sunshine—smothered by billowing steam—dark, dank and soggy with endlessly dripping water—blown by variable winds and subject to changes in temperature—such are the rotting and ruinous conditions under which every cooling tower must operate. Knowing these conditions, Fluor accepts the challenge of the elements and builds Cooling Towers that defy decay. Three-post frame construction, with rigid longitudinal and transverse cross bracing, provides a sturdy foundation of correctly engineered design. California Redwood is used throughout because, of all known woods, it is the most durable under adverse conditions of exposure. It is also strong, light and fire resistant. To the permanency of the wood is added permanency of assembly—with rustless brass nails. Beyond the durability contributed by proper materials is the day-by-day high efficiency that results from Fluor Aerator Type design, insuring successful operation at any outside temperature, in any location, with any wind velocity.

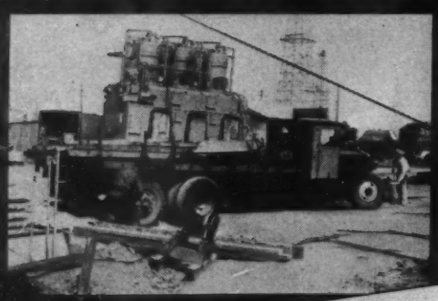
Acceptance of Fluor Aerator Type Cooling Towers is world wide. They are designed and engineered to your conditions of place, altitude, temperature, wind velocity and volume. The structural material is California Redwood, unsurpassed for its resistance to fire, water, heat and dryness. Specific are these Fluor accomplishments: elimination of wind blown spray, measurable reduction in water make-up requirements due to wind loss, utilization of minimum ground space, and the savings and economies attendant to these factors.

THE FLUOR CORPORATION, LTD. Main Office and Plant: 909 59th Street, Los Angeles, California • 909 McCormick Building, Chicago, Illinois • 703 Fairfax Building, Kansas City, Missouri • 1402 Esperson Building, Houston, Texas • 710 Canadian Pacific Building, New York City, N. Y. • 719 McBirney Building, Tulsa, Oklahoma

FLUOR AERATOR TYPE COOLING TOWERS

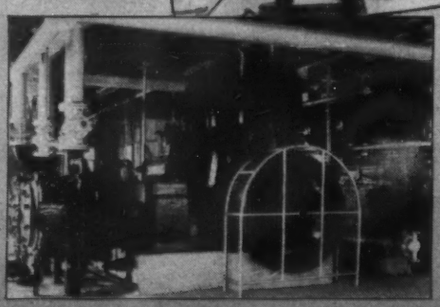
Modernize Your

Old SLOW MOTION Gives way to MODERN



LOW TRANSPORTATION COST

SMALL FOUNDATION



LOW ERECTION COST — ENGINES ARE ASSEMBLED AT FACTORY

The new CLARK Super-2-Angle Compressor is introducing entirely new standards of EFFICIENCY and LOW COSTS in the installation and operation of Gas Booster Stations. This unit equals or exceeds any other type of compressor in power and efficiency, yet effects substantial savings in 5 important ways—as follows:

1. CUTS TRANSPORTATION AND ERECTION COSTS because shipped practically assembled.
2. SMALLER FOUNDATION due to right-angle design.
3. LESS FLOOR SPACE, SMALLER BUILDING.
4. SAVES FUEL, due to CLARK Super-2-Cycle Fuel Injection.
5. LOWER MAINTENANCE due to extreme simplicity of design and few parts.

Engineers throughout the industry are investigating, and important installations are already in operation, from coast to coast. Write for literature.

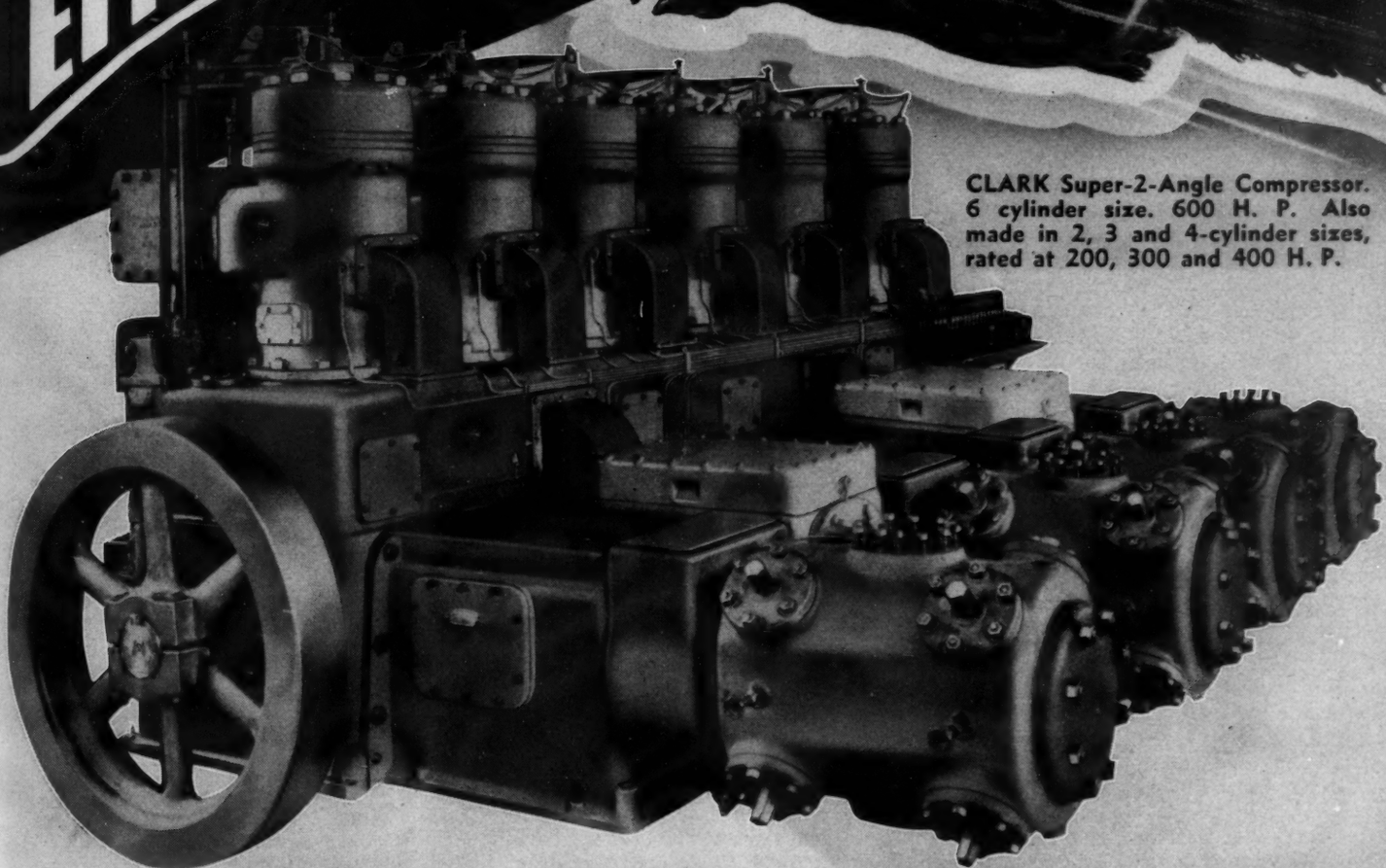
CLARK BROS. COMPANY - Olean, New York, U. S. A.

Export Office: 30 Rockefeller Plaza, New York. Midcontinent Sales Offices and Warehouses: Tulsa, Okla. and Houston, Texas. West Coast Office: Smith-Booth-Usher, 2001 Santa Fe Av., Los Angeles, Cal., Foreign Offices: 72 Turnmill St., E. C. 1, London, England; 4 Str. General Poetas, Bucharest, Roumania.

Gas Booster Station!

SUPER 2 ANGLE

N EFFICIENCY



CLARK Super-2-Angle Compressor. 6 cylinder size. 600 H. P. Also made in 2, 3 and 4-cylinder sizes, rated at 200, 300 and 400 H. P.

CLARK

ADDISON B. DAY

H. L. MASSER

A. B. MACBETH

Merger of Los Angeles Companies Approved; Executive Officers Named

WITH the merger of the Los Angeles Gas and Electric Corp. and the Southern California Gas Co., to be voted upon by stockholders May 11, Addison B. Day, president of the Los Angeles company, will become chairman of the board of the Southern California Gas Co. and A. B. Macbeth will continue as president and general manager, according to plans recently announced.

The California State Railroad Commission has authorized the merger, plans for which were announced soon after the Los Angeles Gas and Electric Corp. sold its $47,000,000 electric system to the city of Los Angeles. Operations will be continued under the name of Southern California Gas Co. Pacific Lighting Corp., San Francisco, owns practically all the common stock in both corporation and company.

Officers of the company resulting from the merger will include, in addition to Mr. Day and Mr. Macbeth, the following:

H. L. Masser, executive vice-president; LeRoy M. Edwards, vice-president and special counsel; T. J. Reynolds, vice-president and general counsel; R. W. Miller, F. J. Schafer, William Moeller, Jr., F. M. Banks, and W. E. Houghton, vice-presidents; C. L. Whitehill, secretary; F. E. Seaver, assistant secretary; E. N. Simmons, comptroller; L. D. Romig, treasurer.

It is contemplated that the following will serve as directors: A. C. Balch, F. M. Banks, Addison B. Day, Garrettson Dulin, LeRoy M. Edwards, Stanley W. Guthrie, W. E. Houghton, Harold Janss, A. B. Macbeth, H. L. Masser, Ben R. Meyer, William Moeller, Jr., Stuart O'Melveny, T. J. Reynolds, F. J. Schafer.

Couzens, Flint, and Vogan Promoted at Cleveland Laboratories

R. M. CONNER, director of the Testing Laboratories of the American Gas Association, has announced several changes and advancements in the executive personnel at the Cleveland Laboratories in addition to the transfer of Dr. F. E. Vandaveer from Los Angeles to Cleveland, related in previous issues of GAS. Dr. Vandaveer resumes his duties as supervisor of both the Cleveland and Pacific Coast Branch Laboratories directly under Mr. Conner.

W. M. Couzens, a graduate of Tri-State College of Engineering in 1926, was recently placed in charge of all the Laboratories' research activities. Mr. Couzens entered the employ of the Laboratories in the Testing Department in 1926. In 1928 he was made chief inspector and during 1929 and 1930 spent a great deal of his time in California as the Pacific Coast representative of the Laboratories. During 1930 he established the Pacific Coast Branch Laboratory and was made its supervisor. He continued at the head of the Los Angeles Laboratory until February, 1933, when he was transferred to Cleveland in charge of the Research Department. Mr. Couzens resigned from the Laboratories in 1934 to accept a position with Grayson Heat Controls, Ltd., where he remained as general manager until early in 1936, when he returned to the Laboratories as assistant chief engineer.

K. H. Flint, a graduate of Amherst in 1923 and Massachusetts Institute of Technology in 1925, has been elevated from chief inspector to assistant chief engineer in the Testing Department. Mr. Flint joined the Laboratories in January, 1926. After wide experience in testing appliances, he was made inspector in 1927 and spent much time in California in 1927 and 1928 as Pacific Coast representative. In 1931 Mr. Flint was promoted to chief inspector, a position which he held until being made assistant chief engineer.

W. H. Vogan, Tri-State College of Engineering, 1927, has been appointed chief inspector to fill the vacancy left by the promotion of Mr. Flint. Mr. Vogan has also had broad experience in the Testing and Research Departments of the Laboratories. His employment with the Laboratories began nearly nine years ago. He assisted in the mixed gas research and pipe joint research extending over a period of several years, later working in the various appliance testing sections. In recent years he has carried on a large part of the field inspections for the Laboratories east of the Rocky Mountains.

■ ■

Thompson, Chubb Join Staff of Calif. R. R. Commission

Frank Thompson and T. M. Chubb have been appointed to the engineering staff of the gas and electric division of the California State Railroad Commission, according to announcement by E. F. McNaughton, director of the public utilities department of the Commission.

Mr. Thompson, industrial engineer with the Los Angeles Gas & Electric Co. since 1932, joined the gas and electric division of the Railroad Commission as associate engineer. His headquarters will be Los Angeles, and that part of the state south of the Tehachapi will comprise his territory. Mr. Thompson's appointment was effective April 26.

Mr. Chubb, who has been with the Pacific Gas and Electric Co. in the commercial and operating department of the San Francisco division, was appointed assistant engineer in the gas and electric division of the Commission. His headquarters will be in San Francisco.

■ ■

Kearney Gives Franchise To Natural Gas Co.

A franchise has been granted to the Aksarben Natural Gas Co., incorporated in Nebraska, by the city council of Kearney, Neb., granting the company permission to distribute natural gas within the community.

The company is seeking franchises in several other towns, including Loup City, St. Paul, Ord, and Burwell, and construction depends upon favorable action by all cities, it is said.

■ ■

J. S. Cullinan Dies in Calif.

J. S. Cullinan, well-known oil field developer, died recently in Palo Alto, Calif. He was founder of oil properties that later developed into the Texas Co. and the Magnolia Petroleum Co., and it was largely through his efforts that Texas' first oil and gas field at Corsicana was opened in 1898.

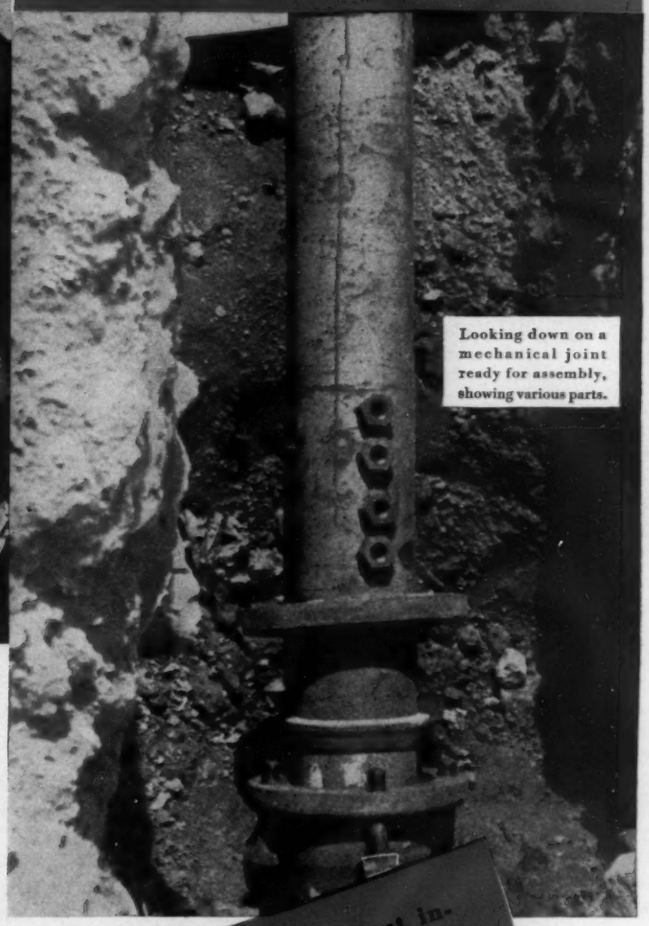
THEN . . .

The same long-lived material

A CENTURY AGO—
A cast iron gas main installed in Boston in 1836 and still in service.

AS NOW

but with modern mechanical joints



Looking down on a mechanical joint ready for assembly, showing various parts.

TODAY—A recent installation of mechanical joint cast iron pipe for gas service.

The gas industry, one of America's oldest, is young compared to the life of cast iron pipe. It is also progressive. So is the manufacture of cast iron pipe. Witness the modern mechanical joint as made by CIPRA members—gas-tight under modern operating conditions—foolproof in assembly—and available with long-lived cast iron pipe in diameters from 1¼ to 84 inches.

CAST IRON PIPE

THE STANDARD MATERIAL FOR UNDERGROUND MAINS

The Cast Iron Pipe Research Ass'n, Thos. F. Wolfe — **Research Engr., 1013 Peoples Gas Bldg., Chicago**

Recent Research on Domestic Ranges

(Continued from Page 28)

heat losses from the walls will become less. It is important to understand, however, that these reductions are not a straight line function of the insulation thickness. The greatest saving in fuel consumption occurs during the first inch of insulation and the reduction in heat losses becomes less as the thickness is increased.

It was found with the special test oven that when 1 inch of insulation was used the fuel consumption was reduced by approximately 33 per cent over that required when the oven was uninsulated. Subsequent increase of insulation thickness from 1 to 2 inches resulted in further fuel reduction of only 11 per cent. Finally, an increase from 2 to 3 inches of insulation was accompanied by an additional fuel consumption decrease of only 5 per cent.

Of great importance in the problem of oven wall losses is the heat flow through metal to metal contacts. No matter how much insulation is placed on an oven, its effectiveness will be greatly impaired if thermal short circuits are tolerated between the inner linings and outer walls of the oven structure. As an example, elimination of metal to metal contact during this research on the special oven having a 1 inch thickness of insulation resulted in a reduction in the maintenance rate, at the 500° F. setting, of approximately 36 per cent. To accomplish similar reduction in maintenance rate by increasing the thickness of insulation, assuming the metal to metal contact was retained, it would have been necessary to increase the thickness more than any reasonable amount over that now found on contemporary ranges. This factor is recognized in most contemporary industrial oven designs.

The effect of nominal input rate on preheating times and speeds was another interesting problem studied during this investigation. It is now common practice to rate oven burners on the basis of 8000 B.t.u. per hour per cubic feet of oven space although higher inputs than this are employed in many cases. Studies made of the effect of input rate increases above 8000 B.t.u. per cu. ft. of oven space on 11 different types of oven construction showed in every case that decreases in preheating time, while not proportional to increase in input, were, nevertheless, quite substantial. The average relationship found indicated a 35 per cent decrease in preheating time for an increase of 100 per cent in input rate. From an economic standpoint, increases in input rates were not found to prove advantageous in that generally higher preheat inputs would, perhaps, be conrate increased. However, increased preheat inputs would, perhaps be considered by many as being more than compensated for by the faster preheating speeds.

Oven Burner Design

One of the most interesting technical problems facing the industry today is that connected with the design of atmospheric burners. A great deal has been published in the literature particularly pertaining to the work of the National Bureau of Standards on this subject. In approaching this topic, the Committee on Domestic Gas Research felt that one of the important phases of this problem, as it pertained to gas range ovens, was the study of burner design from the standpoint of determining the relationships between minimum by-pass inputs and maximum safe gas rates. This problem, therefore, resolved itself into a study of those fundamentals which might permit obtaining turn-down ratios greater than had been indicated by previous technical investigations. With greater turndown ratios, lower by-pass rates can be obtained with nominal or starting rates remaining constant with resultant benefit to low oven temperature maintenance. A practical solution of this problem as it affects low temperature oven performance has been employed, particularly on the Pacific Coast, by automatically turning off one section of a dual burner during maintenance periods, in order that the amount of heat liberated in the oven will be less than would be the case if all ports on the burner were supplying gas during maintenance periods. This development was an admirable one, which came at a time when the industry was faced with a serious problem. Other methods of accomplishing the same purpose are available and operate in a similar way; that is, by either automatically or manually closing off the gas supply to a portion of the oven burner.

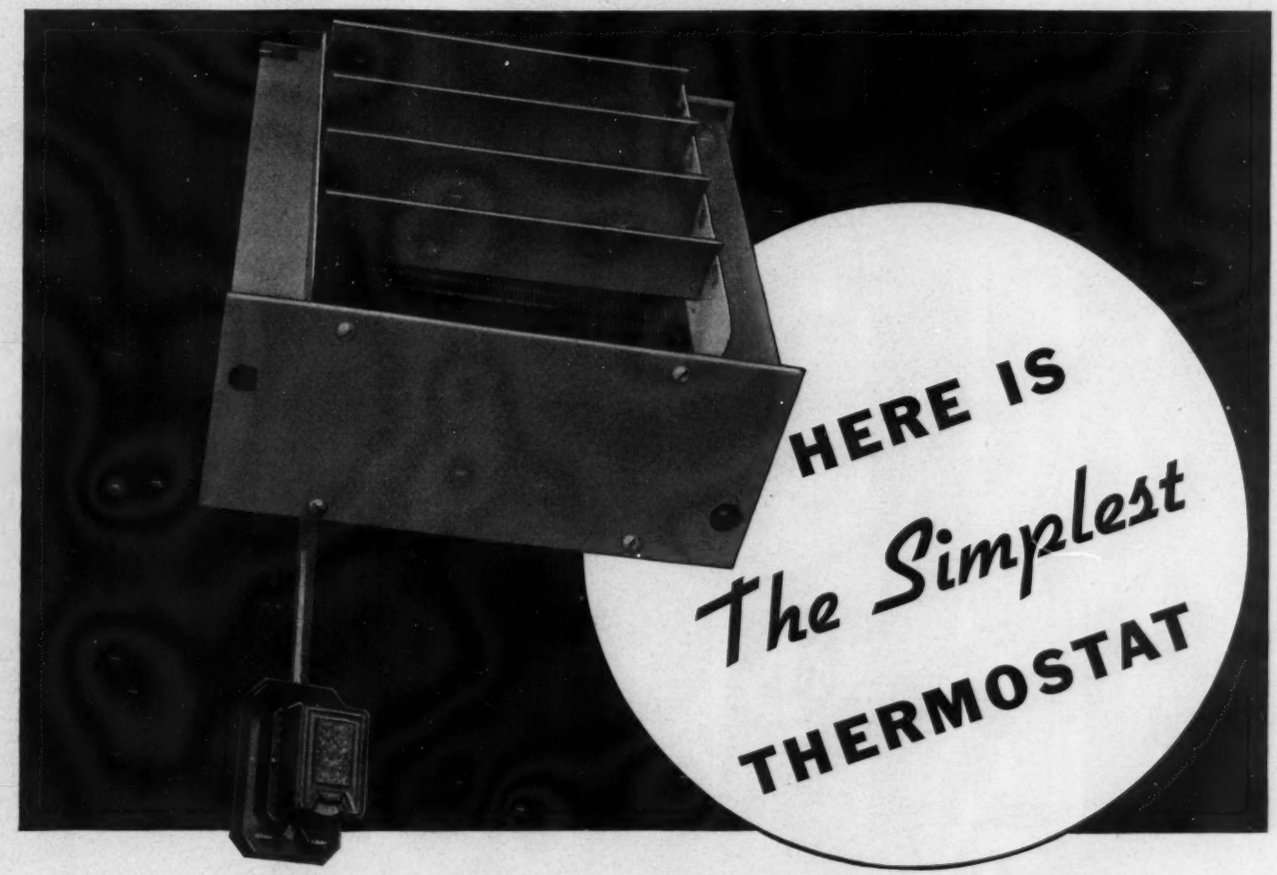
The difficulty which arises is, naturally, the one involved with burning a minimum rate of gas on a burner. It was discovered during the first part of this research, which included a study of the combustion of gases at maximum rates per square inch of port area, that a family of curves could be drawn up, indicating the extremes of adjustment which would be of the same general pattern, regardless of burner design or type of gas. These curves all demonstrated that as we increase the gas input rate per square inch of port area, the range of flexibility became less, until a rate was finally reached where the range of adjustability became zero and blowing of flames with natural gas occurred simultaneously with yellow tip flames.

It appeared from a study of these data that a rate of 30,000 to 35,000 B.t.u. per square inch could be used for natural gases and still retain a reasonable degree of flexibility, providing ample combustion space is provided to eliminate the possibility of flame impingement. The next step was to discover the factors affecting minimum stable by-pass flames.

It was found, when burners were used having the same port area but provided with different size ports, that the minimum by-pass rate was less when larger ports and, consequently, fewer ports were employed. It is important to note that port sizes must be governed also by other performance considerations such as flashback, lifting, and aeration.

Passing many of the progression steps of this study, it seems important, however, to mention that it was found that the minimum by-pass rate was dependent solely on the number of ports and that within the range of port sizes practical in oven burner design it was independent of port size. This statement implies that, if it is desired to deliver less heat to an oven in order to accomplish lower oven temperatures, all that is necessary to do is to reduce the number of ports. As previously stated, this has been accomplished principally on the Pacific Coast by reducing the number of ports during the operation of an oven by mechanical controls. It is entirely possible, however, to accomplish a similar result by reducing the total number of ports in the burner, provided, of course, that (1) sufficient port area is provided to prevent lifting with natural gases and (2) the size of ports as well as their depth are such as to insure freedom from flash-back on manufactured gases.

As an example of the practical application of these important principles, it has been found possible to provide a burner with as few as 70 drilled ports, which will accommodate from 18,000 to 20,000 B.t.u. per hour



for any type of unit heater

The new, better, more economical way to control a unit heater is with a Klixon snap-acting thermostat. It's simpler— because this vibration-proof thermostat is mounted on a short pipe extending from the heater. It's more economical—because there are no long conduits running from heaters to wall-mount the thermostat. And it's better — because you have individually controlled heaters. In areas using several units you can provide more uniform heat—eliminate hot and cold spots—at an unusually low cost.

And remember, Klixon thermostats are positive, snap-acting thermostats — snap-acting because they are operated by the Spencer Thermostatic Disc. There are no complicated parts—toggles, magnets, bellows — *just the disc.* Used with any type of unit heater, they give you accurate warm air or summer air circulation control. The kind of control you've always wanted — the kind *your customers* have always wanted. Send for bulletin.

KLIXON
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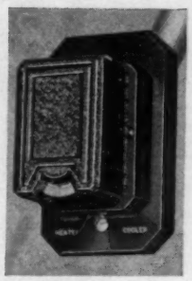
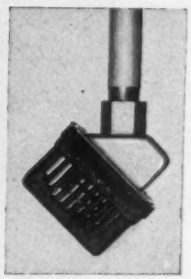
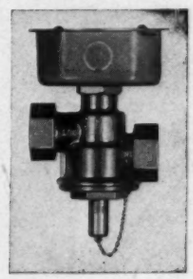




SAVE DOLLARS ON EVERY INSTALLATION

A short conduit, an outlet box, and the thermostat is all you need. Six to ten dollars are saved per installation. Note how the Klixon angular outlet box holds thermostat. Settings and readings are easily made from the floor.



KLIXON UNIT HEATER SWITCH-VALVE

Where required on certain types of unit heaters a Klixon unit heater switch-valve will make your installation foolproof for both heating and summer air circulation.

SPENCER THERMOSTAT COMPANY, ATTLEBORO, MASS.

Proving that

SMITH LINE PIPE

can take it!

There's Reason for

THE WAVE OF ACCEPTANCE

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MILWAUKEE, WISCONSIN • *DISTRICT OFFICES:* NEW YORK, CLEVELAND, CHICAGO, TULSA, HOUSTON, LOS ANGELES

MAKING STEEL WORK FOR YOU AS IT NEVER DID BEFORE IN

SMITH LINE PIPE—SMITH HIGH-YIELD CASING—SMITH PRESSURE VESSELS

HERE is a 24" x 5/16" x 38' length of Smith Pipe, squashed flat as an empty inner tube between powerful bending rolls.

THE SAME 24" "flattened" pipe under pressure test, being forced back to its original shape.

BACK to its original shape, it did not burst until full strength of the steel was reached.

ABUSE! Sure, we went far beyond all practical requirements of pipe line service in this test. But it shows what a wide margin of safety Smith Line Pipe really has.

as a nominal rate, and approximately 2500 B.t.u. as a minimum rate. These lower minimum by-pass rates will, of course, permit obtaining oven temperatures as low as necessary or desired. At the present time, research activities are being continued on burner design and on the fundamentals of oven aeration and venting.

Broiler Sections

One of the first considerations given broiler sections affected ways and means of developing a method of measuring broiler performance accurately. Rather extensive studies were made to determine the best and most reliable method of temperature measurement in broiler areas. Various arrangements were employed varying from plain thermocouples to thermocouples silver soldered to a small copper disc mounted on an asbestos pad, both disc and pad being given a dull black finish. This latter arrangement proved on the basis of numerous meat broiling tests to be capable of giving reproducible results, as well as absorbing a greater amount of radiant heat than any of the other equipment used. As in the consideration of ovens, there are two important phases to the broiling cycle; first, the preheating period, and second, the phase wherein the temperature is maintained at equilibrium. Analysis of these two phases indicates that they are affected by such factors as input rate, type of broiler compartment, radiant surfaces, and flame characteristics.

It is interesting to note that with any given style broiler, the equilibrium temperature bears a very definite relationship to the input rate, which implies that in order to increase equilibrium broiler temperatures a given percentage without constructional change, it is necessary to increase input rates a relatively higher percentage. For example, with a 50 per cent increase in input rate, the average equilibrium broiler temperature was found to increase in the order of 30 per cent. During preheating periods, the broiler temperature or rate of preheat was found to increase in nearly the same proportion as increases in input rate.

In the matter of flue losses, both from the standpoint of speed and economy, performance was found to be improved as excess air concentrations were reduced. Insulation thickness and density exerted an effect on broiler performance similar to that found for oven sections. With higher insulating values produced by increased thickness or densities, heat losses through the walls were reduced with resultant higher equilibrium broiler temperatures at any given input rate. Increased heat capacity, however, resulting from increasing the mass of insulation, tended to increase the time of broiler preheating.

The effect of radiant surfaces was determined qualitatively by several tests with radiant screens and refractory radiants. Metallic radiant screens were found to be effective in elevating broiler temperatures, particularly during the first part of the preheating cycle. This result may be explained by the fact that the heat capacity of the screen material was low and, as a consequence, the screen heated quickly to incandescence. Refractory radiants employed during these tests were also effective in elevating broiler temperatures and increasing broiler preheating speeds. The application of such materials to broiling will be found to be interesting, and should result in elevation of temperatures above those commonly experienced in conventional type broilers. Where radiant type materials are not employed, it is found that the type of flame is of considerable importance in obtaining satisfactory broiler characteristics. It has been found, for example, that the application of yellow flame burners resulted in greater heating-up speeds, higher average equilibrium temperatures and more uniform temperature distribution. Comparison of meat cakes broiled with yellow flame burners with those prepared using a blue flame showed a distinct difference, in favor of the former. When yellow flame burners were operated to produce temperatures where external charring occurred, a moist, tender product resulted. Cakes prepared with the blue flame burner under comparable temperature conditions, however, did not exhibit these characteristics, in that a definite crust was formed of about the same thickness, regardless of broiling temperature. In spite of the advantages which seem to be possessed by luminous flame burners, considerable care must be exercised in applying this type of burner to commercial production. Mechanical problems of suitably baffling and aerating such burners are difficult, although it is believed they are entirely possible of solution.

An interesting series of tests was conducted at constant input rates but with varying port areas on Bunsen type burners. With input rate remaining constant, the flames became longer, of course, as the total port area or number of ports was reduced. With the longer blue flames much higher broiler temperatures and greater speed were observed than under the same test conditions and input rate but with larger port area and, consequently, with shorter blue flames. In fact, long blue flames seem to have yielded broiler speeds and temperatures nearly comparable to those obtained with luminous flame burners.

Top Sections

Investigational work on range top sections has been confined largely to studies to determine the effect of variations in input rate, utensils, and top section constructional features on top burner thermal efficiency and speed. While economy and speed are extremely important considerations, it must be recognized that other performance characteristics such as heat distribution, combustion, flexibility from the standpoint of abnormal conditions, and burner operating characteristics, likewise are important and should, as a consequence, receive as much attention in top section design as the two other essential sections of the range previously discussed. It is intended as this project progresses to study fundamentals of burner design and possibly of other variables affecting those top burner performance characteristics which have not been treated to date.

A considerable part of our top section work was devoted to the relationships between thermal efficiency or speed, size of utensil, and input rate variations produced by throttling. Under most conditions of utilization, throttling of 9,000 B.t.u. per hour burners from their rated capacity to as low as 3,000 B.t.u. per hour had little effect on the thermal efficiencies obtained with any one of several sizes of utensils, although of course efficiencies varied from one utensil size to another. This behavior seems important in that it establishes a standard of performance which should be maintained in any future developments.

As would be expected, thermal efficiencies were found to decrease as utensil diameters were decreased. It is important to note, however, that with certain types of top section construction, the thermal efficiency decreases at a much more rapid rate as the size of utensil is decreased than with other designs. Furthermore, heat distribution characteristics of burners and top structure yielding extremely low efficiencies with, for example, a 3¼-inch diameter utensil, were not generally satisfactory. When designs in which comparable efficiencies were obtained with 3¼-inch and

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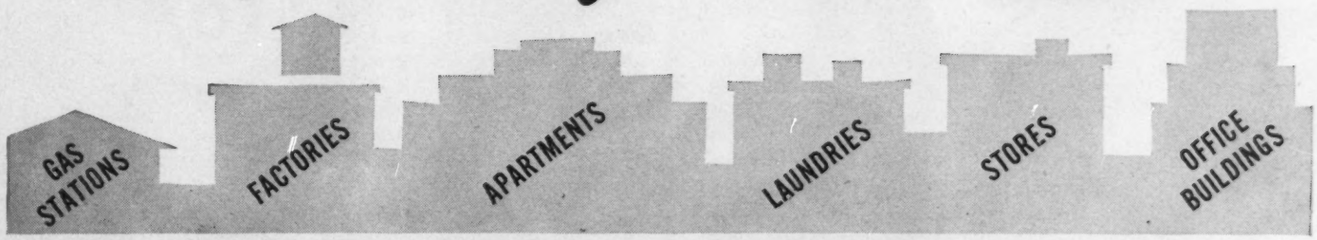

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LYCOMING NATURAL GAS ENGINES—make it possible for firms in hundreds of different kinds of business, to make their own electric light and power, for less than ½ what it costs to buy it.

These new Lycoming Engines operate on GAS, only. They tremendously increase your market, by creating hundreds of new Gas buyers, and increasing the consumption of many of your present users.

Lycoming Gas Engines replace purchased electric current, either by means of generation, or by direct application to the load. They are amazingly economical in operation; quiet, vibrationless, and can be installed anywhere. Engineered for 100,000 hours dependable duty.

For businesses requiring 24-hour continuous duty, Lycoming offers a Dual-engine unit that eliminates standby necessity and further increases economy.

Lycoming Natural Gas Engines and Gas-Engine Generating Units are built complete in one factory, which has a world-wide reputation for producing efficient, reliable quality engines in many fields. Write us for complete information.

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7¼-inch diameter utensils were studied, however, heat distribution characteristics were much more satisfactory. Thus, in making tests to stimulate the overall efficiency and effectiveness which might be expected under widely varying utilization conditions, it would seem advisable to employ an extremely small diameter utensil as well as the more commonly used A.G.A. standard test utensil.

Very interesting results were obtained from studies of the comparative efficiencies and speeds of burners designed for and operated at input rates of 6,000, 9,000 and 12,000 B.t.u per hour respectively. It was found possible to obtain considerably greater speed with 12,000 B.t.u. input burners than with the 9,000 at very little additional, and in some cases, with less, input for a given heat output requirement. On the other hand, 6,000 B.t.u. per hour burners, while being more efficient than the 9,000, were appreciably slower. For example, with the 7¼-inch diameter utensil, a 6,000 B.t.u. per hour burner required 44 per cent more time than a 9,000 B.t.u. per hour to perform the same operation with a total fuel reduction of only 4 per cent. Real possibilities in future development on burners having input rates higher than 9,000 B.t.u. per hour seem to be indicated by these results.

One of the most important phases of the top burner work involved a study of the effect of the several component parts of the top structure on thermal efficiency. Briefly, this investigation covered such factors as burner design, size, location, and material of aeration bowls or plates, secondary air control, insulating grates from top structures, design and placement of top burner grates, and burner placement. It was found, in general, that the effect of changes in any one of these variables on top burner efficiency was relatively small, assuming of course that in no case was any design considered which did not comply with the existing gas range approval requirements. However, all factors in the aggregate had considerable effect on thermal efficiency. It is essential, therefore, if optimum efficiency is to be obtained without departing too radically from conventional designs, to examine carefully each component of design from the standpoint of its relationship to fundamentals of heat transfer and combustion as well as its effect on other structural features. For example, if a burner has poor air injecting characteristics, excessive burner heights and venting heights must be provided to permit complete combustion, and efficiency suffers even if burner and venting heights are the minimum consistent with safety. On the other hand, if the burner is capable of high primary air injection, then both burner and venting heights can, in general, be decreased, other factors of design remaining the same, with the resultant increase in efficiency. A further practical conclusion supported by these data is that reasonably high efficiencies approaching the optimum possible can be obtained with practically all contemporary types of burners such as round flat-flame, round angle flame, and star burners, provided all other pertinent features of top burner design are carefully studied and brought into proper relationship with the particular type of burner involved.

It seems certain in view of the results obtained on this phase of the project, that in spite of appreciable advances in thermal efficiencies during the past year or so, there is still room for improvement of the average level of performance. When the average level reaches this demonstrated maximum, which may be obtained without radical departure from conventional design, then our industry will be offering to the public gas ranges possessing top burner thermal efficiencies nearly 50 per cent higher than those prevailing 5 years ago. Today the average level of thermal efficiency is approximately 30 per cent higher than that of 5 years ago. A complete summary of the data published to date will be found in the Association's bulletin "Domestic Gas Range Research." This excellent technical presentation will bear the closest study by gas utility men and manufacturers alike.

A. G. A. Reports 1936 Natural Gas Sales As Highest in Industry's History

GROSS sales of natural gas during 1936 were the highest in the industry's history and revenues exceeded those of 1935 by $39,589,000, according to figures compiled by the American Gas Association, while sales, revenues, and customers in the manufactured gas field increased notably in 1936 over 1935. The report confirms for the industry as a whole the individual company statements which have shown that in 1936 the gas industry definitely pulled out of the depression.

Gross sales of both natural and manufactured gas in the United States in 1936 amounted to 1,594,287,000 M c.f. This was 201,417,000 M c.f. more than in 1935.

Gross sales of natural gas were 1,240,986,000 M c.f. in 1936, a gain over the previous peak in 1935, when the gross sales amounted to 1,061,577,000 M c.f.

Revenues for the industry as a whole in 1936 totaled $772,697,000—a gain over 1935 of $45,605,000. Manufactured gas revenues were $360,048,000 in 1936—a gain over the preceding year of $6,016,000.

Sales of natural gas for industrial and commercial purposes show the most remarkable increases, according to the A. G. A. statistics. From a depression low of 427,146,000 M c.f. in 1932, industrial sales of natural gas rose to 781,779,000 M c.f. in 1936. This was 140,621,000 M c.f. greater than in 1935.

Commercial sales of natural gas have increased steadily during the depression, except for one year—1933. Even then, 15,338,000 M c.f. more gas was sold for commercial purposes than in 1929. Commercial sales in 1936 exceeded those of 1929 by 40,212,000 M c.f.

Domestic sales of natural gas in 1936 passed even the peak of 1930. Domestic sales last year were 346,396,000 M c.f.; in 1930, they were 344, 904,000 M c.f.

The natural gas industry served 6,603,900 customers (monthly average) in 1936; the manufactured gas industry served 9,634,200 (monthly average). Total for the industry in 1936 was 372,500 more than in 1935.

■ ■

E. A. Clark, Columbia Gas Vice-President, Passes

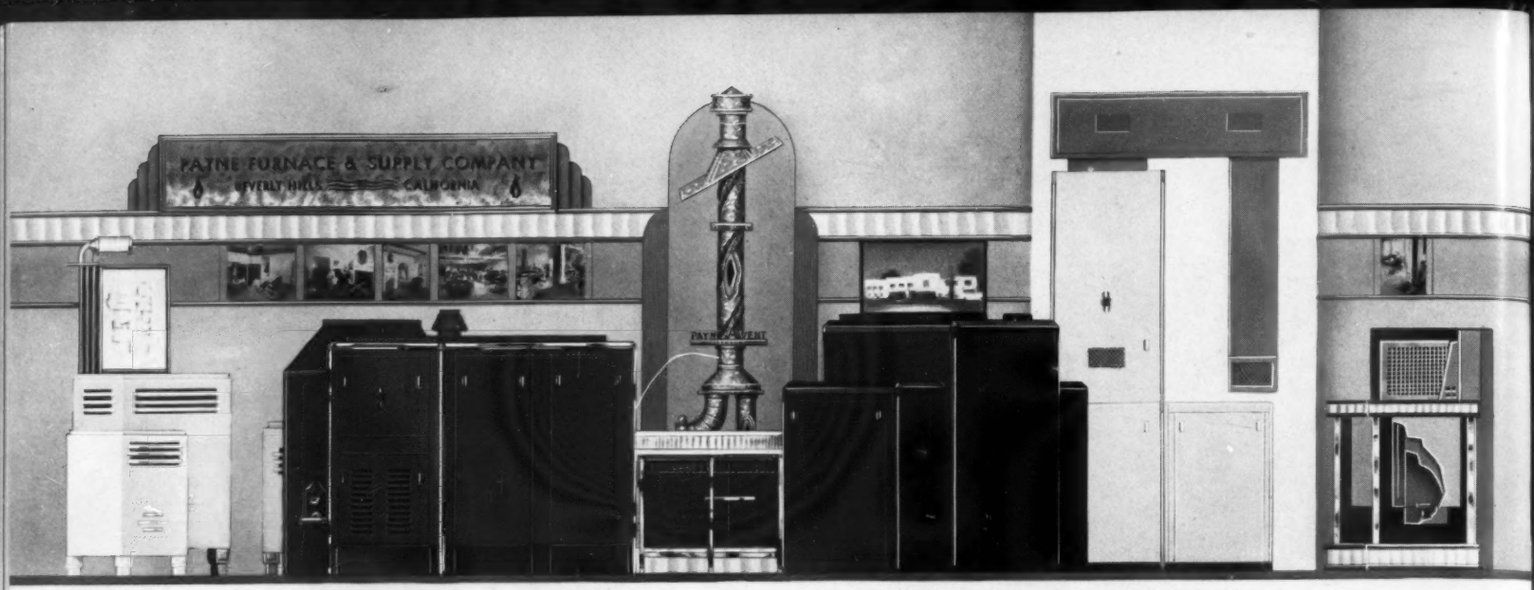
Earle A. Clark, vice-president of Columbia Gas and Electric Corp., New York, N. Y., died in late February after a brief illness. Mr. Clark entered the gas industry as assistant to his father, an operator in Pennsylvania and an early developer of the Nowata field in Oklahoma. Mr. Clark joined the Columbia system in 1930 after 13 years with the Oklahoma Natural Gas Co. in Tulsa. He was a specialist in the study of natural gas and methods of measurement.

■ ■

Georgia Natural Extends Line

Georgia Natural Gas Corp., Atlanta, Ga., is building three and one-half miles of natural gas mains from Milledgeville through Hardwick and Midway, Ga., according to press reports. The extension of the company's line will serve about 175 customers, it is reported.

PAYNE On Parade!



Here's a Display of Gas Appliances Worth Seeing!

NEW Payne Products for your '37 Campaigns

YOU will easily understand that the pride in our NEW Gas Appliance Models is justified when you have visited the exhibit of the NEW Payne equipment in Booths 379 and 380 at the Kansas City Convention.

And, we feel sure you will find the Payne line to be the most complete, with more points of merit than has ever before been offered.

They're NEW, and yet each of the appliances being made by Payne reflects the knowledge and skill gained through a quarter of a century of experience in engineering, manufacturing and installing gas burning equipment exclusively.

The success of your load building heating campaign can be assured if you use Payne products. They help you to gain consumer confidence.

We will be glad to greet you and discuss your heating problems during the Convention . . . Booths 379 and 380.

PAYNE FURNACE & SUPPLY COMPANY, INC.

BEVERLY HILLS, CALIFORNIA

Testing Laboratories Issue Domestic Gas Range Book

AN 85-page illustrated bulletin outlining the results of the first 12 months' research work on gas ranges conducted by the American Gas Association Testing Laboratories under the supervision of the Committee on Domestic Gas Research, was published by the Laboratories early in January. While the results presented, according to Laboratory officials, are neither complete nor conclusive, it was believed that sufficient data had been collected to warrant their publication for the guidance of interested member companies. Additional basic research is now being conducted to supplement the data presented.

The fundamental studies reported in Bulletin No. 7 relate to certain phases of oven, broiler and top burner performance involving such factors as combustion, heat losses, insulation, venting, efficiency, speed, etc.

Complimentary copies were mailed in January to each member gas company, gas range manufacturer and producers of gas range thermostats. Additional copies may be secured from the American Gas Association, 420 Lexington Avenue, New York City, or from the Testing Laboratories, 1032 East 62nd Street, Cleveland, Ohio.

■ ■

Senator Drafts Natural Gas Conservation Bill

A bill designed to control interstate commerce in natural gas and encourage its conservation has been drafted by U. S. Senator Prentiss M. Brown, Michigan. Regulatory powers would be vested in a federal commission. The bill would affect holding companies controlling interstate pipe lines and subsidiaries in more than one state.

The measure as drafted by Senator Brown would permit states, with consent of Congress, to conserve their supply and regulate production; would authorize the commission to review rates which interstate pipe lines charge distributing companies; require pipe line companies to obtain the commission's approval of contracts; require interstate pipe lines to serve any town requesting natural gas.

■ ■

East Ohio Gas Co. Broadcasts Mystery Chef Program

Starting with the broadcast of May 4, The East Ohio Gas Co., Cleveland, Ohio, joins the Mystery Chef radio program, using the facilities of NBC Station WTAM. The extension of the program to Cleveland will be made from Buffalo Station WHEN, and the area served by Cleveland's Station WTAM will reach all customers of The East Ohio Gas Company.

With the addition of The East Ohio Gas Company the Mystery Chef program is now being sponsored by companies having more than 6,000,000 domestic gas meters in active service.

This shows a tense moment during the first dress rehearsal of "The March of Time," broadcast over the CBS network and sponsored by Servel, Inc., manufacturers of Servel Electrolux gas-operated refrigerators. The broadcast ties in with the spring and summer refrigerator selling campaigns conducted by the gas utilities in all parts of the country. The broadcast began April 15 to continue for thirteen weeks.

Servel, Inc., Sponsors "March of Time" In Industry's Latest Radio Effort

SERVEL Electrolux, new sponsors of The March of Time for a series of thirteen weekly half-hour programs, is carrying the story of refrigeration by gas to an audience of many millions. The Servel program is heard Thursday night over the greatest nation-wide chain ever arranged for The March of Time by any sponsor. Forty-five key stations on the Columbia Broadcasting System form the hook-up.

This nation-wide advertising program ties in with the spring and summer refrigerator selling campaign conducted by gas utilities and appliance dealers in all parts of the country.

Use of radio to carry the message of Servel Electrolux to thousands of people on the gas lines who may be in the market for a new refrigerator is part of the extensive advertising campaign carried on by Servel, Inc., in magazines, trade papers, and daily newspapers. Special attention will be given to emphasizing the backing of Servel Electrolux by the American gas industry in the commercial portion of the broadcast.

The March of Time, now in its seventh year, is regarded as one of the most popular programs on the air, having stood highest in several annual polls conducted by radio editors throughout the country. Other local and national polls have given a high place to the broadcast because of its entertaining and educational character. It recently won a special award of the Academy of Motion Picture Arts and Sciences.

The March of Time is broadcast from the studios of the Columbia network in New York City from 10:30 to 11 p. m. Thursday. New York went on daylight saving time on April 25 and the program is thus received in the various time zones an hour earlier than it was before the change to daylight time.

Commenting on the program, Louis Ruthenburg, president of Servel, Inc., said that the Servel Electrolux sponsorship of The March of Time will give a strong impetus to gas refrigeration, because it will carry the story of this modern gas appliance into the homes of millions at the psychological time—during the height of the refrigerator selling period, and that this distinguished radio program will build good will for gas and gas service.

Publicity assistance is provided by Servel to gas companies and dealers so that they may tie in their local advertising with the national program.

■ ■

Cities Service Adds Hydrogen Sulphide Removal Plant

Cities Service Gas Co., Bartlesville, Okla., has been licensed by The Girdler Corp., Louisville, Ky., to build and operate a Girbotol Process plant near Lyons, Kan., for the removal of hydrogen sulphide from natural gas.

The plant will purify 10,000,000 cu. ft. of gas per day for distribution to domestic and industrial consumers. The hydrogen sulphide content of the gas will be reduced from 135 to less than 1 grain per 100 cu. ft.

Completion of the plant is scheduled for early summer.

SALES SLANTS

A month by month presentation of experiences on the sales front.

One Stressed Appearance, the Other, Performance—Who Closed the Sale?

"SO far as study, hard work, and determination go," said a gas appliance salesman of our acquaintance, "I consider myself a pretty good salesman.

"I not only read all the helpful sales literature I can get my hands on, I study it. I am at work early and I quit late. I get in anywhere from eight to twelve calls on the average every day. And I'm a pretty determined fellow because I don't drop a prospect until I'm sure the chances for a sale are nil.

"But I'm learning fast that these are not the only things that make for a good appliance salesman—measured by results, of course, because that's the only measure you can apply.

"There's the little matter of knowing what interests your prospect and getting your sales story across to him in the light of that interest.

"A recent experience of mine put that thought over in a vivid way. I uncovered a prospect for a modern gas range. He was 'hot.'

"Now, you don't rock along with a hot prospect. In line with what I know to be good salesmanship, I pushed right through before his interest could wane.

"I talked to him at his office and I called at his home and talked to his wife. I made an appointment for the next evening when I could talk to them together.

"I had been in this business long enough to know that it's foolish to count a sale until you get the signature, but here was a prospect who showed intense interest right at the start. I felt as reasonably sure of a sale as a fellow can feel without actually having it.

"You can understand my disappointment, therefore, when for no reason that I could see, the prospect said no.

"The sale was eventually made, but it was my manager who pulled the fat out of the fire.

"And how did my manager succeed where I had failed?

"I was trying to sell the range for its sturdy construction, its fine porcelain finish, the thickly insulated walls and similar physicial properties. The prospect was interested in these things, to be sure, but he was not satisfied in his mind that they would justify the price he had to pay.

"And my manager? He talked about these things, too, but not for what they were but what they would do! He never let the prospect lose sight of the more healthful meals that could be prepared, the time that could be saved, the elimination of cooking failures and dozens of other advantages the housewife understood.

"That's what my prospect was interested in. That's what he was willing to buy, and that's what he did buy.

"Since this experience, I can truthfully say that I'm a better salesman because I have learned a cardinal rule: The big thing is not what your goods are, but what they will do and how they will benefit the prospect!"

Hi, folks—I'm Little Nat—off to look for ideas at the Kansas City Natural Gas Convention. I'll be seeing you every month in the columns of GAS.

■ ■

The True Sales Object—To Make People Want to Buy

I AM a gas appliance salesman.

I have often asked myself what makes the difference between a successful salesman and one who fails or barely gets along. For instance, I know a man who has been selling for more than three years and has averaged eight calls every working day, yet he hardly makes a living. On the other hand, I know another salesman who doesn't work half as hard, but he is a producer.

I think I can give you the answer. I have been in the business for several years and I have passed from the years when sales came slowly, and in some cases not at all, to a top ranking place on the sales force.

Most people would say that it is a matter of experience. But that's not entirely right. I've known too many men who, after several years, were not much better than on the day they started.

Experience will mature a man and help to give him a better insight into the job at hand, but a fellow needs more than a record of years in the business to be a good salesman.

We need only to remember that people like to buy and that a person will buy most anything if he wants it badly enough. To my mind, a successful salesman does nothing more than give a prospect the opportunity to buy.

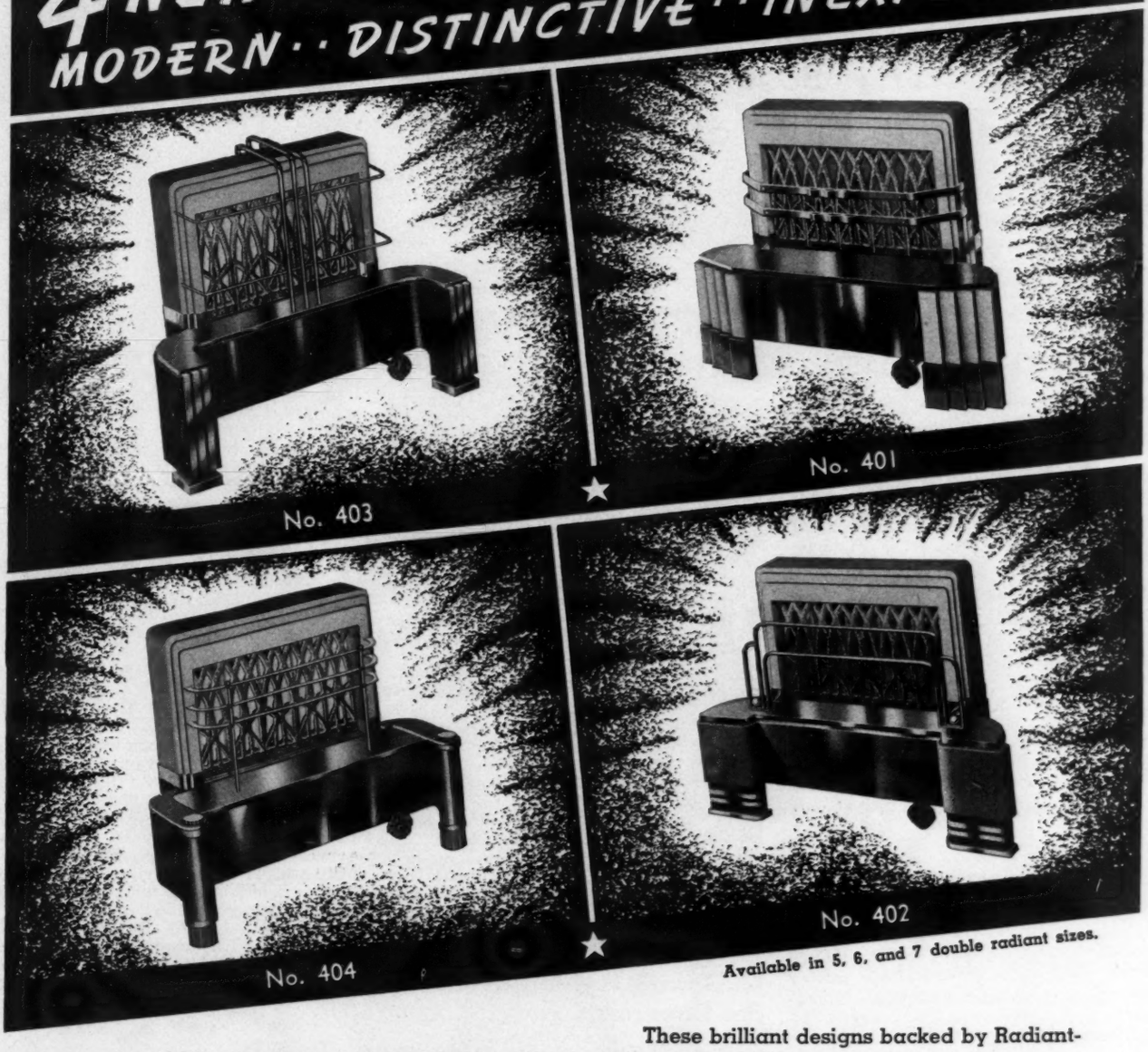
Of course, it is not as simple as it sounds. A salesman, for instance, who says to a prospect, "I have a modern gas range to sell and I'll take your order for it," might consider himself as having given the prospect an opportunity to buy.

But let us see! Actually no opportunity exists if the prospect fails to recognize it as such. She must be shown the advantages to her before she will recognize opportunity and grasp it.

Who wouldn't pick up a hundred dollar bill found in the street together with all the advantages it repre-

Announcing 4 NEW HUMPHREY RADIANTFIRES

MODERN · · DISTINCTIVE · · INEXPENSIVE



Available in 5, 6, and 7 double radiant sizes.

Up to the minute in modern design — the last word in operating efficiency — priced for the mass market — these new Radiantfire models give you everything you need for outstanding sales success this Fall. New buying power has opened a tremendous market.

These brilliant designs backed by Radiantfire prestige will be a powerful help in your program to increase gas loads. Send for the new catalog, illustrating the 400 series in natural colors, and the 1937 merchandising portfolio with proven campaign plans and helpful selling aids.

GENERAL GAS LIGHT COMPANY

KALAMAZOO, MICHIGAN

EASTERN OFFICE
23 WARREN ST., NEW YORK CITY

HUMPHREY PRODUCT

WESTERN OFFICE
475 ELEVENTH ST., SAN FRANCISCO

sents? Yet it is hardly likely that you would give it a second glance if you were convinced that it was an ordinary scrap of paper.

I have never failed to make a sale yet where the prospect was able to buy when the opportunity I brought was haloed with the advantages

Most salesman miss out because they spend their time trying to "sell" a prospect rather than trying to cause her to "want to buy."

Just remember: If men and women want to buy, they will. You only need make them feel that want and then give them the opportunity to buy.

Sale Lost! The Boss Failed to Give The Salesman Full Data on the Lead

MORE to illustrate a point than for any lesson it might contain, the following story is repeated. It was told like this:

"I don't kid myself into believing that I'm a model salesman. I know the temptation to soldier on the job, to complain about how unfair the boss is at times, to waste a lot of valuable hours on the sales floor when I ought to be out on sales calls.

"But there does come a time when, in spite of your own wrong doing, the boss is more in the wrong than you.

"Yesterday, the boss handed me a gas refrigerator prospect. Fact was, this woman had called in to ask for information about Electrolux. She said she was just shopping around and wanted some idea about prices and terms.

"This meant, of course, that she was getting information on every make of refrigerator. Not only was she ready to buy, but she wanted to be sure she wasn't missing a chance to get the best refrigerator available to her.

"Give me a prospect like that anytime. When it's only a question of 'which is best,' I'll get a sale 9 times in 10.

"But the boss failed to state these facts. The only information I had was the woman's name. I saw no reason to make a rush call in view of the fact that I already had three prospects who needed immediate attention.

"When I did call, I discovered that the woman had already bought another make. Sore? I had good cause to be. It was a money loss to me and the boss was at fault for not giving me all the information I should have received.

"However, things would have been all right if they had ended there. But when the boss found out, he laid the blame on me. I was already sore about it because I knew it to be the boss's fault and I stood my ground.

"I didn't lose my job, but I might have. And the boss and I are on none too friendly terms."

Perhaps it is not often that a sales manager calls a man to account without good excuse. But because these things can and sometimes do happen, it might be to the best interest of the profit ledger for the sales manager to remind himself occasionally that he is not infallible.

■ ■

Spain Is Advertising Head of New Jersey Utility

Thomas H. Spain has been appointed advertising manager of Public Service Corp. of New Jersey, according to announcement by John L. O'Toole, vice-president in charge of public relations. The position is newly created.

T. H. SPAIN

Mr. Spain joined Public Service in 1927 as advertising assistant in the publicity department. Before that time he was on the publicity staff of the Ingersoll-Rand Co. in New York. He is a graduate of the University of Michigan, and is a director of the Public Utilities Advertising Association.

■ ■

McGowan Heads Advertising For Consumers Power

Donald McGowan, newspaper man, has been appointed head of the advertising and publicity department of Consumers Power Co., Jackson, Mich. Garrett Gething will assist him.

Mr. McGowan has been in newspaper work for 18 years. He was with the *Detroit News* much of that time. He was assigned to the Washington Bureau of News for a period, and since 1928 has been chief of the Lansing News Bureau.

■ ■

Natural Gas Revenue Up 3.6%

Natural gas utilities reported revenues of $47,847,100 for January, 1937, a gain of 3.6 per cent over the figures for January, 1936, according to figures released by the American Gas Association. Revenues of the industry as a whole showed an increase of 1.2 per cent.

Philadelphia Co. Names Hyde Advertising Manager

ANTHONY HYDE, formerly promotion manager of the Washington (D. C.) Herald, has been appointed advertising manager of the Philadelphia Gas Works Co., Philadelphia, Pa.

ANTHONY HYDE

Although a newspaperman, Mr. Hyde is not a newcomer to the utility field, having been affiliated in 1932 with the Washington Gas Light Co. Although still in his early thirties, Mr. Hyde has held positions affording him a variety of merchandising and advertising experience.

A graduate from Yale, he specialized in economics, merchandising and advertising. Upon leaving Yale, he took a job on the Washington Times. Following this early newspaper experience, Mr. Hyde became successively advertising manager, director of advertising and public relations, and assistant to the president of the Washington Gas Light Co. In this last position he was responsible for the merchandising activities of the company.

■ ■

Johnson Made Sales Manager Of Puget Sound Co.

Patrick Johnson, assistant general sales manager since 1936 of the Puget Sound Power & Light Co., Seattle, Wash., has been promoted to the position of general sales manager. The appointment was effective March 9.

Mr. Johnson has been with the company since 1929. He was superintendent of the gas department in Bellingham and assistant to the vice-president in charge of sales, in Seattle, before he was appointed last year as assistant general sales manager. He has been in utility work for nearly twenty years, having held positions with Stone & Webster, Boston; Western United Gas & Electric Co., Aurora, Ill.; Haverhill Gas Light Co., Haverhill, Mass., and the Columbia Electric & Power Co., Columbus, Ga. He is a graduate of Georgia School of Technology.

■ ■

Gas Service Schools Feature Sorby and Barbara Jenkins

Six company properties of The Gas Service Co., Kansas City, Mo., held one-day cooking schools early in April featuring six-year old Barbara Jenkins and E. C. Sorby, sales promotion manager of the George D. Roper Corp. The schools were conducted in Fort Scott, Pittsburg, Kansas City, Independence, Wichita, and El Dorado, all in Kansas. Both Barbara and Mr. Sorby had previously appeared before large audiences in Kansas City and Wichita.

F. M. Rosenkrans, new business manager, and C. D. Greason, director of publicity and advertising of The Gas Service Co., accompanied the two demonstrators.

PROVE the VALUE of MODERN EQUIPMENT with ACTUAL DEMONSTRATIONS

TURN WASTED DOLLARS INTO Added Profits ...AT YOUR COFFEE URNS
Hotels, restaurants, lunch counters find that 10% to 25% can be saved in fuel costs by controlling temperature with Robertshaw coffee-urn thermostats
In addition to their dollar-saving advantages, Robertshaw coffee-urn thermostats insure the finest coffee flavor. They automatically control the brewing temperature. They preserve sweetness and aroma for long periods of time. They reduce scaling and burnouts. They save coffee and cream.
Robertshaw thermostats save so much that it will be money in your pocket to inquire. Ask your gas company or equipment dealer.
OBERTSHAW THERMOSTAT CO.
YOUNGWOOD, PA.
BERTSHAW COFFEE URN THERMOSTATS
o little—save so much
STEAM- OR GAS-HEATED URNS
ROBERTSHAW

For example

PROVE IT WITH A *Robertshaw-equipped* COFFEE URN

Here's a demonstration that will get you orders for complete kitchen modernization. Try it!

Just ask restaurants to install a Robertshaw thermostat at (for example) a coffee urn. Then have them check the savings.

You'll get sales results because Robertshaw thermostats have made fuel savings of 10% to 25% and more!

Demonstrations like these plant the seeds of complete kitchen modernization. They've actually caused whole restaurant chains to replace old urns with new Robertshaw-equipped urns.

ROBERTSHAW THERMOSTAT CO.
YOUNGWOOD, PA.

Robertshaw helps you sell kitchen modernization in ads that go to your prospects. Take advantage of the publicity. Give your customers a sample of Robertshaw savings. They'll like it—and ask for more.

ROBERTSHAW COFFEE URN THERMOSTATS

Cost so little—save so much

Memphis Utility Advertises Industrial Gas on Blotters Enclosed With Bills

TO advertise gas for industrial use, Memphis Power & Light Co., Memphis, Tenn., has put to work blotters carrying a brief message about industrial firms in Memphis that use natural gas. The blotters were first used during the past year. During 1937, four one-page newspaper advertisements will also deal with gas as industrial fuel.

A blotter is enclosed with each service bill on alternate months. The company adopted this way to insure getting its message into the office of the man who pays the bill, according to H. H. Hungate, Jr., industrial engineer, who will deliver a paper at the Kansas City Natural Gas convention this month on "Specialized Selling of Natural Gas."

Each blotter is headed, "Do You Know—." Under this heading follows a statement such as these:

"The Hotel Peabody uses in one month enough Natural Gas to heat 100 Memphis homes all winter!"

"Ford Motor Co. in Memphis spends for freight and labor almost one hundred times the amount of money spent for gas fuel in their big plant."

"Fisher Plant of General Motors in Memphis employs 2600 people. Has largest single unit wood-working plant in world. Freight movement is 12,000 cars per year. Has used Natural Gas Fuel since 1929."

Usually some concluding line is carried, such as: "Users Say Gas Heat Is Not Costly."

The company has found, according to Mr. Hungate, that the names of nationally known firms carry much weight. Smaller concerns are reminded, says Mr. Hungate, that they are "missing a bet" if they do not also utilize gas.

It is difficult to evaluate advertising results, but during the year since the blotters were first distributed, the sales force of Memphis Power & Light Co. has been busier than at any time since 1929, the installation crew has more contracts for installations than at any time during the past five years, and the company is spending little or no time on bill complaints.

■ ■

Gas Service Co. Offers Six A.G.A. Trips as Prizes

Six sales representatives of The Gas Service Co., Kansas City, Mo., will receive free trips to the annual convention of the American Gas Association which will be held the week of September 27 at Cleveland, Ohio, according to an announcement by F. M. Rosenkrans, new business manager. These free trips are prizes in a two-months' water heater campaign which got under way April 1. The first part of the campaign closed April 30 and the second part will be held in June.

During the campaign 10 points are allowed for the direct sale of each automatic storage water heater, 5 points for the sale of each water heater already on the lines under the rental plan, and 3 points for the renting of a water heater. All new business salesmen, including floor salesmen, who have a total of 200 or more points for the two-months' campaign are to receive gold watches, with the exception of the six salesmen winning the convention trip.

More points are being allowed on the direct sale of water heaters than for the rental of equipment in line with the policy of the company of gradually reducing the volume of rented equipment.

■ ■

Henry Obermeyer Receives Consolidated Edison Post

Henry Obermeyer, for several years in charge of the advertising of Consolidated Edison Co. of New York, has been elected an assistant vice-president of the company. He is a past president of the Public Utilities Advertising Association.

H. OBERMEYER

Mr. Obermeyer, a former newspaper man, joined the Consolidated Gas Co. as advertising copywriter in 1926, and was later assistant to the vice-president and director of the Advertising Bureau, and, when the company's gas and electric operations were consolidated, he was placed in charge of the gas, electric and steam advertising of the Consolidated Edison System, as assistant to the executive vice-president.

Before joining the Consolidated Gas Co., he was editor of the American Gas Association Monthly.

■ ■

Gas Co. of New Mexico Makes Personnel Changes

Personnel changes have been announced as follows by the Gas Co. of New Mexico, Dallas, Texas:

J. R. Cole, division superintendent, Clovis, has been promoted to the position of vice-president and director.

J. H. Wilson, district superintendent at Clovis, has been transferred to Santa Fe as district manager there. J. C. Reid, who has been at Santa Fe, returns to the home office of the Southern Union Gas Co., Dallas.

Herman Cole, local manager at Clovis, succeeds J. H. Wilson as district superintendent at Clovis.

H. N. Oldham has been promoted from assistant district superintendent to district superintendent at Carlsbad.

■ ■

Grover Nash Named Assistant Purchaser for Lone Star

W. Grover Nash, chief clerk at Dallas, Texas, of the purchasing department, Lone Star Gas Co., has been promoted to the position of assistant purchasing agent. He succeeds N. F. Nyegaard, who resigned to enter the sales field, and who is now with the Southwest Supply Co., at Dallas.. Walter Roberge, chief order clerk. has been appointed to the position of chief clerk. Gay Davis, order clerk, takes Mr. Roberge's place as chief order clerk.

Changes were announced by Ben R. Newbery, puchasing agent.

"Litle Nat says the new clock-controlled range is O. K. He's just been checking it with Western Union."

Life SUSTAINING DROPS OF WATER . . . CAN *Wreck* YOUR CHIMNEY WALLS!

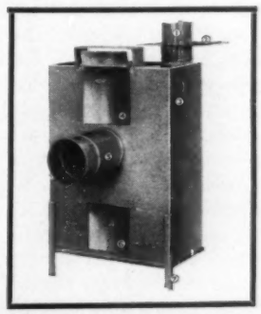
Here are harmless sparkling drops of water so desperately needed by growing things—yet that same glistening bead of dew (condensation) can destroy chimneys, waste dollars, cancel hard-won goodwill and still the wheels of a thriving business!

Moisture absorbed by brick and mortar *freezes* and E-X-P-A-N-D-S! It is the beginning of chimney cracks —heat loss, ruined plaster and wall paper, and ultimate stack destruction. Costly in money, and customers justly protest vehemently!

To overcome the corrosive action of Condensation, use VITROLINER—THE PERMANENT CHIMNEY LINER. Made of high quality heavy gauge stock iron with special high temperature acid resisting vitreous enamel—inside and out. It fulfills every requirement for perfect chimney inner liner and a positive bulwark against condensation.

To further increase the efficiency of heating plants, install a Howle Heat Extractor. This sensational inexpensive new development redirects, and radiates heat which would otherwise pass out of the stack as waste, into the basement, raising temperatures from 10°- 22° F.

The Howle Heat Extractor is equipped with *Baffles* and *Storage Pans* to collect the condensate. So effective is the unit in extracting heat that you cannot touch its front surface but you can lay your cheek against its rear! The saving in fuel and repairs will more than pay its cost in two years plus the added satisfaction of a livable basement.



BOOTH NO. 129

Condensation Engineering Corporation welcomes and invites conventioneers to Booth No. 129 where new developments in heat loss and Condensation control will be on display.

Further information will be sent if you send your request to

CONDENSATION ENGINEERING CORPORATION

335 SOUTH WESTERN AVENUE • CHICAGO, ILLINOIS • PHONE: MONROE 1031

Cooperation was the keynote of Public Service Co. of Colorado's Three-Legged Race. Above is shown a group of first heat winners in this gas-electric sales event.

Three-Legged Race of Public Service Co. Of Colorado Stirs Low-Month Sales

By ROY G. MUNROE

Public Service Company of Colorado

FOR many years the Denver property of the Public Service Co. of Colorado has provided a convincing demonstration of the advantages to be gained from the proper operation of a combined gas and electric utility company. Gas and electric activities are co-ordinated in the operating and accounting departments; gas engineers and electric engineers work harmoniously in conjunction with each other; and accounting department functions, such as meter reading, customers' billing, contract and investigation department service, are rendered by the same set of men.

The Public Service Co. of Colorado avoids the destructive competition between gas and electric utilities which saps the resources of such companies in many other communities. An example of the manner in which gas and electric salesmen are partnered and co-ordinated with each other in their sales solicitation is the Three-Legged Race sales contest now being carried on between the 44 pairs of domestic gas and electric sales representatives in the Denver New Business Department.

Under the present plan of new business operation in effect in Denver, the city is divided into 44 sales territories, with a domestic gas representative and a domestic electric representative partnered together on each territory. In turn the city is divided into four sales supervisors' districts, with a domestic electric sales supervisor and a domestic gas sales supervisor partnered together on each District. Eleven sales representatives report to each supervisor. The four pairs of sales supervisors and the 44 pairs of sales representatives are pitted against each other in the sharpest sort of rivalry. However, care is taken to avoid any semblance of competition between the two gas and electric sales supervisors in a given district, or between the two sales representatives in a given territory. Every endeavor is made to bring about partnership and friendly co-operation between the gas and electric men working on the same sets of customers in the same area. The paired salesmen compete for prizes in cash, and in Cities Service gasoline and oil coupons, on the basis of combined gas and electric sales totals day by day and week by week.

The first heat of this Three-Legged Race was run during February. The basis of the contest was the total gross combined domestic gas and electric merchandise sales turned in day by day by the various pairs of contestants, $25.00 in sales representing one city block on a large chart-board posted in the main hall of the building.

At the end of the month, total combined sales amounted to $60,000, compared with $34,000 during the same month of the preceding year. A victory meeting was held, when the two supervisors in charge of the winning sales district were honored, as were the pairs of sales representatives on the highest territories for the month. At this meeting the members of each team of gas and electric representatives were seated side by side, with the sales supervisors similarly seated partner by partner.

The Three-Legged Race Sales Contest featured gas storage waterheaters and Illuminating Engineering Society portable lamps. As a result of the month's activity, 155 storage water heaters and 100 I. E. S. portable lamps were placed on the company's lines. February has always been the lowest sales month in the year, and it is believed that much additional sales production resulted from the friendly co-operation of each gas or electric sales representative with his partner.

The February Three-Legged Race was so successful that it was decided to run a second heat during March.

At the end of March combined gas and electric merchandise sales totalled $91,162 as against sales in March, 1936, of $53,159.

■ ■

19,000 Visit Gas Displays At Chicago Midwest Hotel Show

MODERN commercial gas equipment was displayed at the Midwest Hotel Show in Chicago, Ill., March 23-26, in an exhibit sponsored by the Industrial Gas Section of the American Gas Association in co-operation with The Peoples Gas Light and Coke Co. of Chicago. Attendance at the show, held at the Hotel Sherman, exceeded 19,000.

Displayed in the gas exhibit were three of the industry's important fuel applications—the gas deck bake oven with thermostatic heat control, gas fired volume water heaters, and gas refrigerators. The latter were featured for additional refrigeration needs where it is more economical to install and operate individual units than to disturb and extend connections to existing central installations.

This exhibit was organized by the Committee on Displays at National Industrial Expositions of the Industrial Gas Section of the American Gas Association. H. A. Sutton is chairman of this committee and T. J. Gallagher, of The Peoples Gas Light & Coke Co., is vice-chairman. The gas booth was under the direct charge of Mr. Gallagher, who was assisted by other local gas men and exhibiting manufacturers' representatives.

■ ■

El Paso Co. Spends $375,000 Removing Hydrogen Sulphide

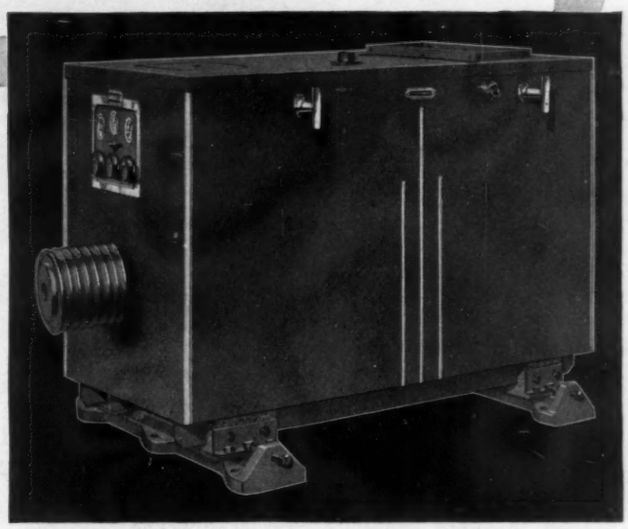
To remove the hydrogen sulphide in gas it serves, the El Paso Natural Gas Co. has spent $375,000, according to a statement to the press by C. C. Cragin, vice-president.

The company's gas has no hydrogen sulphide, Mr. Cragin is quoted as saying, and less than one grain of total sulphur. He cited the Texas law for "sweet gas" as less than one and a half grains of hydrogen sulphide per 100 ft. or 30 grains of total sulphur.

REDUCE YOUR POWER COST 75%

Fully Automatic . . . Sound Silenced

GAS ENGINE POWER



FOR *Domestic and Commercial Air Conditioning, Refrigerating Equipment and General Power Applications*

● A package power unit that operates on gas fuel . . . for air conditioning and refrigerating equipment, and general power applications . . . the Waukesha DeLuxe Gas Engine combines automatic convenience with smooth, quiet, dependable operation *at low cost*—proved by thousands of miles of railway air conditioning experience.

Gas fuel is so economical that your power cost, with this Waukesha Engine, is only about one-fourth that of electricity. Since there is no crankcase dilution, and no carbon formation, maintenance is also reduced to a minimum.

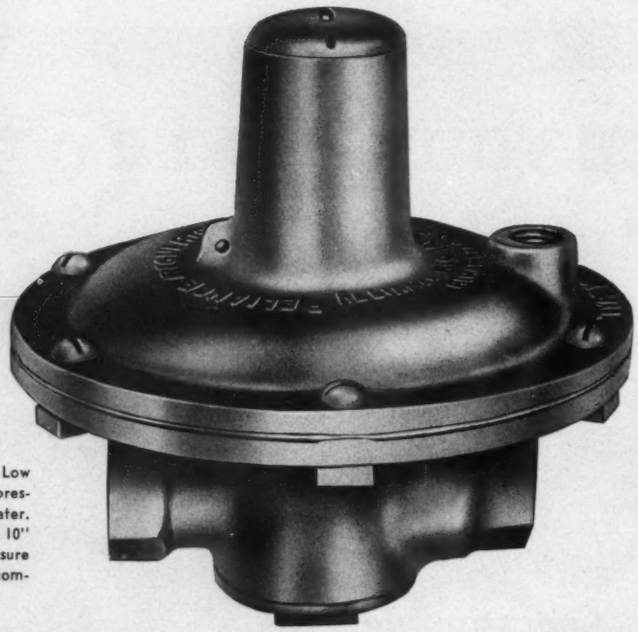
Fully automatic, the Waukesha DeLuxe Gas Engine may be remotely controlled with the same convenience, and with the same sensitive means of regulation, as an electric motor.

In operation it is remarkably smooth *and quiet.* Entirely enclosed in a specially constructed sound-silenced cabinet — vibration is completely absorbed by its cushion mounting. The engine is water cooled by a self-contained radiator system. The quiet, pressure-type blower draws the air noiselessly through the cabinet and over the radiator cooling surfaces.

Waukesha DeLuxe Gas Engines are made in three sizes . . . a four-cylinder unit and two six-cylinder units, respectively developing 10-21, 25-42, and 41-87 hp. . . . especially ideal for operating pumps, blowers, ventilation fans, air and refrigeration compressors, and electric generators. *Bulletin 1048 gives complete details . . . write for it.*

Refrigeration Division • **WAUKESHA MOTOR COMPANY** • *Waukesha, Wisconsin*

WAUKESHA *DeLuxe* GAS POWER UNITS



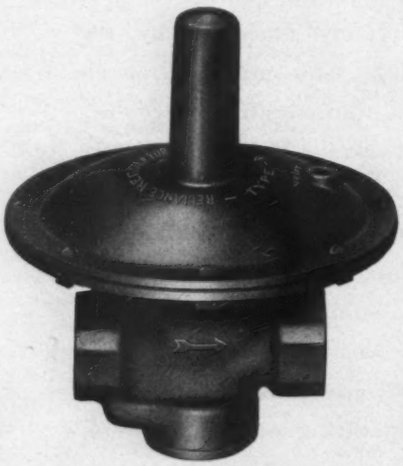
Spring loaded models of Type "Y" Low Pressure Regulators provide an outlet pressure range between 2" and 7" of water. Special springs can be supplied for 10" outlet pressures. Maximum inlet pressure for which these Regulators are recommended is 30" of water pressure.

REGULATORS YOU CAN RELY ON — RELIANCE — SINCE 1910 — TRADE MARK

LOW PRESSURE APPLIANCE REGULATORS

APPROVED BY A.G.A.

Reliance Low Pressure house Regulators are widely used on all appliance installations such as water heaters, heating furnaces, space heaters, gas refrigerators and all appliances that demand constant gas pressure at the burners to insure uniformly efficient operation. In the Type "Y" Regulators shown above, the employment of a single valve principle insures positive control with minimum pressure loss through the Regulator; extremely low lock-up pressure is maintained when no load exists, and is effected by a rounded self-centering brass valve in contact with a soft white metal valve seat disc. Five sizes are available, from 3/8" to 1-1/4" inclusive. All Type "Y" Regulators are easily adjustable and have a bottom handhole plug for quick inspection of valve and valve seat disc, and for removal of any accumulation of scale or dirt.



Reliance Type "A" Spring Loaded Model Low Pressure Regulator.

TYPE "A" REGULATORS

These Regulators are made in both spring loaded and dead weight models, and are used in appliance service where uniformly low pressures are required. They are exceptionally efficient on low pressure distribution systems where it is often necessary to boost pressures on peak loads. They handle large volumes with low differential pressures. The bottom plate or plug can be removed for cleaning, and, if necessary, the valve and valve seat can be removed without disturbing the upper diaphragm assembly. Laminated leather valve seats are used, having two finely finished surfaces with a center section made of center back cowhide. Contact surfaces of the valve seat discs are made of finely grained calfskin with the grain of the leather placed for valve contact. All parts are made of the best available materials. Absolute lock-up of pressures without creeping is an outstanding feature of these Regulators.

Reliance Type "A" Dead Weight Model Low Pressure Regulator.

RELIANCE REGULATOR CORP.

1000 Meridian Ave. Alhambra, Calif.

Regulators for Manufactured, Natural and Butane Air Gases

RELIANCE REGULATORS

MEASUREMENT and CONTROL

Calif. Meter Association Hears Papers by Bradley, Smith

The April meeting of the Southern California Meter Association, held on April 22 at the Van Matre Inn, Huntington Park, featured a talk by F. E. Bradley, Chanslor-Canfield Midway Oil Co., on "Recorder Ink and Paper," and a talk by J. S. Smith, Texas Co., on "Gas Coefficients." Mr. Smith reviewed recent work of H. S. Bean, physicist of the National Bureau of Standards.

Entertainment during the dinner hour was furnished through the courtesy of the American Recording Chart Co. Jimmie Dunn acted as master of ceremonies. Foy Draper, U. S. C. athlete and captain of the winning 400 meter relay team at the last Olympics, spoke on his travels with the team.

The announcement of this meeting was printed on recording chart paper.

■ ■

Earth Slide Breaks Two Lines From Kettleman Hills

An earth slide during torrential rains recently threatened to break the gas supply from the Kettleman Hills fields to Los Angeles, Calif., when two transmission lines were torn out and a third endangered. By means of the third line and other lines from the Los Angeles and Ventura basins, uninterrupted service to domestic and commercial users was maintained. Industrial customers, on low industrial rates subject to shut-off, were reduced to the extent of 105,000,000 cu. ft. of gas daily.

The slide occurred on the Old Ridge route, where three lines parallel each other. It destroyed 150 ft. of a 26-inch pipe line and 100 ft. of a 12-inch line. A 22-inch line held until emergency crews erected temporary supports.

■ ■

P.C.G.A. Recommends Bulletin On Gas Measurement

"Tentative Standards for the Determination of Super-expansibility Factors in High Pressure Gas Measurement" is the subject of Bulletin No. TS-354, published by the California Natural Gasoline Association. The Pacific Coast Gas Association co-operated in its preparation, and at the P. C. G. A. Spring Technical Conference a resolution was passed recommending its use by member gas companies. The P. C. G. A. board of directors has also endorsed the bulletin.

■ ■

B. G. Waggner, Meter Chief, Retires from P. G. W.

B. G. Waggner, superintendent of the meter division, The Philadelphia Gas Works, Philadelphia, Pa., retired recently after 38 years in the division. He had served as inspector, assistant shop foreman and shop foreman. He was associated in the development of an improved click and an improved prepayment mechanism, both bearing his name.

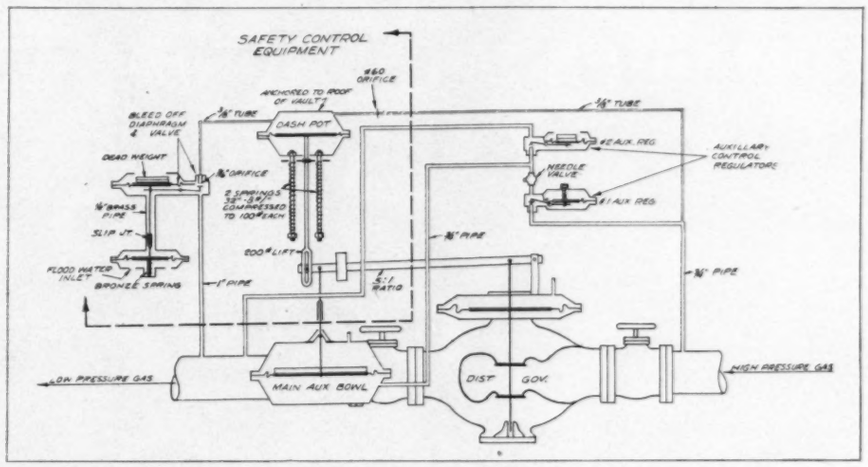


FIG. 1. Schematic diagram of gas district governor vault equipment.

Safety Control for Gas Governors

THE following description of the safety control for gas governors was furnished to *GAS* by K. S. Van Epps, gas engineer, Western Division of Public Service Co. of Northern Illinois, Chicago, who designed the device.

The governors which regulate high pressure gas from transmission mains into the low pressure distribution system, located in underground vaults, have at times caused serious operating problems due to flood water and poor pressure regulation.

The attached sketch is of a safety control that limits the pressure on the low side of a gas distribution governor to a predetermined valve above normal operating pressure which might be caused by leaky or ruptured diaphragms, failure or faulty operation of the auxiliary control system, or flood water in the vault. In case of flood water in the vault, the governor is closed by this control when the water reaches a level of approximately 18 inches below the roof of the vault and the governor is held closed until the water level is lowered. If it is not desired to close the governor tight when the vault is flooded, adjustments can be made so that the governor will be held open to any desired degree until the water has been removed.

The principle of this safety control is two springs compressed to approximately 200 lbs. tension which are attached to the valves of the governor through a clevis on the arm. These springs are held in the clear and ready for any emergency by high pressure gas under a heavy diaphragm in a dash-pot attached to the springs. The flow of high pressure gas into the dash-pot is limited by a small orifice installed in the connecting line. The springs come into service and tend to close the governor valves whenever the high pressure gas is released from under the diaphragm, which is done by a valve operated by either of two methods: one by the presence of excessive pressure on the low pressure side of the governor, which opens the bleed-off valve by lifting the bleed-off diaphragm; the other method is by the presence of excessive water which automatically lifts the flood water diaphragm, which in turn opens the bleed-off valve and releases the springs.

This device is so arranged that in case of complete submersion of the equipment, the bleed-off valve is held open because the lower diaphragm is larger and the head of water is always greater on the flood water diaphragm than on the bleed-off diaphragm.

For this control to operate it is not necessary to run any vents or piping outside the vault or above the vault roof. There are no leather diaphragms or parts that will deteriorate from water, oil, or any other conditions found in underground vaults. The diaphragms used are of rubber duct ply material of 50 lbs. per sq. in. test.

(Continued on Page 112)

BUTANE-PROPANE NEWS

Lone Star Offers New Butane Service Plan in Rural Areas

By J. W. MARTIN

Lone Star Gas Company*

AFTER a few years of experience in providing Stargas, a conventional two-drum type of bottle gas service, to families beyond reach of our pipe lines, it became evident that this type of service would fall far short of the volume that the potential rural market should produce. This rural market in our territory, consisting mainly of tenant cotton farmers, necessitated a service that would be sufficiently low in cost for such a market to use gas for house heating as well as for the three basic uses: cooking, water-heating, and refrigerating. Such service, called "New Stargas Service," is now provided.

J. W. MARTIN

Instead of using liquid propane as in bottle gas service, we use liquid butane, because a given amount of heat can be stored, transported, handled and delivered more cheaply in the form of butane than in the form of propane. Also the butane supply is many times that of propane.

Method of Rendering Service

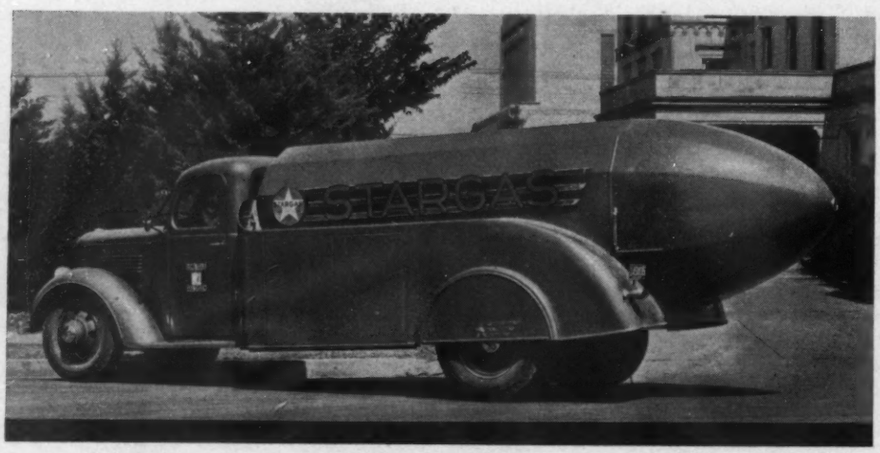
This butane is removed from natural gasoline at our own natural gasoline plants and transported in tank cars to district storage plants strategically located with respect to market. Especially constructed tank trucks deliver the butane from these district storage plants to the customer's tank. Each tank holds 250 gallons of butane, a sufficient amount to run an average customer about six to eight months. Each customer tank has a gage which reads in gallons direct and indicates the contents of tank at any time. These gages are read each month and the amount used by each customer each month is thereby determined, permitting the customer to pay for service on a monthly basis. By means of these monthly readings, a continuous service is provided without the customer's even having to notify the local office that his supply is low. When the gage reading shows a tank to have from twenty-five to fifty gallons remaining in it, the delivery truck is ordered to fill that particular tank by a certain date.

The truck is routed to take care of four customers each trip out; that is, each truck has a capacity of about 900 gallons of butane. By the system outlined above, an average of about 200 gallons is delivered to each customer each time, allowing the truck to unload with a safe margin left over. The trucks are routed to take care of four customers in the morning and four in the afternoon. It is to be noted here that this control of deliveries insures that these trucks make individual deliveries of not less than 200 gallons, trip deliveries of 800 to 900 gallons and daily deliveries of 1,600 to 1,800 gallons on the days that deliveries are required. This insures a controlled minimum delivery cost per gallon and is the secret of low cost distribution of the commodity to domestic users as well as a method of providing to a rural customer as continuous and trouble-free gas service as his city cousin enjoys.

Cost to Customer to Install

All equipment necessary to bring service to the yard line of a rural customer is furnished and maintained by the company the same as for a city or pipe line customer. The customer pays for the yard line from tank to housepiping, for his housepiping, and his appliances. A security deposit is required to insure payment of bills. As a concrete example of original cost, assume that a home of six rooms desires service. The total cost to the customer for installation of the tank, for the yard line, and for six base openings in the house all set up and ready to use would amount to $52. This can be paid for on time if desired and this is the term price. The appliances for this service must meet the American Gas Association specifications prescribed for use with propane gas. However, the cost of such appliances to the rural customer is the same as the same appliance suit-

* Reprinted from the January Blue Blaze News, published by Lone Star Gas Co., Dallas, Texas.



LONE STAR special stream-lined tank truck used in servicing "New Stargas" consumers is shown at left.

A CORNER of the assembly shop at Dallas, showing "New Stargas" tank units in the various stages of assembly and test, is seen above. Claude Page, left, is attaching regulator to top of tank. Jack Lyons, rear, is giving a unit its final test before insulation jacket is installed around tank. Paul Thompson, right, is applying a locking strip which holds the sections of the jacket in place. Assembly of the units is in charge of Walter Garner, Lone Star Gas Company shop superintendent at Dallas, and Dave Reedy, assemsembly specialist.

able for pipe line service in the city.

The cost to install New Stargas Service is therefore approximately the same as the cost of installing gas service in a city home where the gas main is in the street or alley.

Cost to Use

At the above rates the average monthly bills for cooking, water-heating and refrigerating, run between $5 and $6. The annual bills for New Stargas customers residing in Dallas County using gas for all purposes, including househeating, compared to customers in the city of Dallas using natural gas whose requirements and usage appear to be the same, show that the New Stargas customers' annual bills only run from 30 per cent to 50 per cent higher.

For a buyer to purchase the same number of heat units in the form of electricity as he does at these rates (See Table No. 1) in the form of butane, electricity would have to sell at the following rates:

	Net Cost
Rate A: First 293 Kwh per mo. at	$0.0095 per Kwh
Next 879 Kwh per mo. at	.0048 per Kwh
All over 1,172 Kwh per mo. at	.0037 per Kwh
Rate B: First 293 Kwh per mo. at	$0.0078 per Kwh
Next 879 Kwh per mo. at	.0048 per Kwh
All over 1,172 Kwh per mo. at	.0037 per Kwh

Our commercial butane has a distillation range from about 10° F., initial boiling point, to about 32° F., end point. Its latent heat of vaporization is about 835 B.t.u.'s per gallon. Because of these characteristics, it is evident that some form of heat must be applied to butane in winter months during low atmospheric temperature and high fuel demands, to keep it above its boiling point and provide ample pressure under all possible adverse conditions.

Above-ground Storage

Our first thought in setting up a customer's equipment was to bury the tank below the frost line and thereby provide ample pressure. With a sufficiently large tank, such a method will provide ample pressure, but the hazards involved with a buried tank were and are too great. The rate of corrosion of buried pipe lines or tanks carrying, or storing water, gasoline, oils, gas, etc., though high enough even when coated with the best protective material, is accelerated on buried butane tanks due to the fact that the refrigeration produced in the tank when butane evaporates causes a continuous condensation of moisture on the surface of the tank, thereby providing the most ideal condition for rapid corrosion. Also, buried tanks cannot be practically inspected over their entire surface at regular intervals nor are they readily portable. Hence, it became essential to develop an above-ground storage container and means for insuring ample pressure under all weather and load conditions.

The above-ground storage unit that was devised has already been fully described in G A S (March, 1937, pp. 54 and 70, with diagrams). The meth-

TABLE NO. 1. RATES FOR SERVICE

Minimum Monthly Bill $2

A: For first 10 gallons per month	@ 30c per gallon
Next 30 gallons per month	@ 16c per gallon
All over 40 gallons per month	@ 13c per gallon
B: Where customer uses a gas-fired refrigerator.	
For first 10 gallons per month	@ 25c per gallon
Next 30 gallons per month	@ 16c per gallon
All over 40 gallons per month	@ 13c per gallon

A discount of 2 cents per gallon is allowed for prompt payment of monthly bills and applies to both A and B rates. The rates quoted above are gross.

Just the propane cylinder valve you have been looking for . . . combines the famous Kerotest Forged Brass Diaphragm Packless valve design with a spring safety device which automatically relieves *only* the excess pressure that may build up in a propane cylinder. Furnished with or without operating handwheel. Listed as standard by Underwriter's Laboratories.

KEROTEST MANUFACTURING CO.
PITTSBURGH, PA.

ods and apparatus employed are fully covered by patent grants.

In conclusion, the advantages of the New Stargas unit may be summarized as follows:

Advantages of New Stargas Unit

1. Using this method, a certain size tank is capable of carrying a greater load than the same size tank could if buried and ground temperatures used to provide vaporizations.

2. Being above ground, the investment is not exposed to soil corrosion, thus insuring more service years.

3. It is designed to permit a complete inspection of all surfaces, readily, without taking the unit out of service, which contributes to longer life, lower up-keep costs and greater assurance that the unit is in safe service condition.

4. As no part of this unit is buried, the hazards from leaking liquid butane following service line and accumulating under house do not exist.

5. The entire investment including the foundation is readily recoverable should pipe line service become available or should the customer discontinue service for any other reason.

6. The cost of installing or removing this unit is very low.

7. The adjustable and controlled supply of heat to provide vaporization in all kinds of weather and under extremely varying loads makes possible the use of a standard unit to provide service for all classes of domestic customers, from those using ranges only to those having central heating furnaces as well as a range, water heater and refrigerator.

■ ■

R. G. Tower Named West Coast Manager for Bristol Co.

The Bristol Co., Waterbury, Conn., announces the promotion of R. G. Tower, to Pacific Coast district manager with headquarters in the Rialto building, San Francisco, Calif. Mr. Tower's promotion consolidates the company's sales and service organization on the west coast, which includes branch offices at Los Angeles, San Francisco and Seattle and a service laboratory and branch factory in San Francisco.

R. G. TOWER

Mr. Tower has been a sales engineer of The Bristol Co. since 1922. He has been connected with the New York, Chicago, Philadelphia, Pittsburgh, and St. Louis offices and served as district manager of the St. Louis office for a number of years.

Under Mr. Tower's direction the company's facilities will be expanded to make available prompt and efficient service to the users of Bristol's instruments in the Pacific Coast states.

■ ■

T. P. Payne Named Treasurer of Brooklyn Union

Thomas P. Payne, since 1920 auditor of The Brooklyn Union Gas Co., Brooklyn, N. Y., has been elected treasurer of the company by the board of directors. He succeeds Herbert Wellington, who died recently.

Charles J. Fue, who joined the company as assistant auditor in 1927, was elected auditor. Assistant Auditor Glen E. Foster was elected comptroller, a newly created post.

Mr. Payne entered the employ of the Brooklyn company as office boy in 1895. In 1909 he was appointed accountant. In 1910 he was elected assistant treasurer, in 1915, assistant auditor, in 1916, assistant auditor and assistant treasurer, and in 1920, auditor.

■ ■

Natural Gas Plant Operated At Haven, Kan., by Empire

Empire Oil & Refining Co., Bartlesville, Okla., has started operation of a natural gas plant at Haven, Kan., to use gas from fields in the vicinity. After processing, according to information from D. A. Howard, director of employee relations, the residue gas is delivered to the Cities Service Gas Co. 10-inch line, which is two miles north. The booster capacity, which is 7, 500,000 cu. ft. a day, is supplied by five Clark compressors.

NOW READY—published March, 1937

The SUPPLEMENT to the Handbook Butane-Propane Gases 2nd edition . . . $1.00 Per Copy

A record of the past two years of progress in the *Liquefied Petroleum Gas Industry*

This publication together with the 1st and 2nd Editions of the Handbook constitutes a complete library on the subject of Liquefied Petroleum Gases

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GAS
The Natural Gas Magazine

810 S. Spring St.
Los Angeles, Calif.

Lycoming Names McFarland Gas Engine Sales Head

E. D. Herrick, president of Lycoming Manufacturing Co., Williamsport, Pa., has announced the appointment of J. T. McFarland to the position of sales manager of the natural gas engine division of the company.

J. T. McFARLAND

McFarland is widely known in the Diesel and gas engine fields and for the last 18 months has been associated with Worthington Pump & Machinery Corp. in various capacities. He spent five years as an engineer for this company in the oil fields and in turn was manager in charge of sales for this company in the El Paso and St. Louis districts. From 1934 until his connecton with Lycoming he was western manager of the oil and gas power division of the company, with headquarters in Chicago. He is a graduate of Purdue University with a degree in mechanical engineering.

■ ■

Rochester Utility Issues Comprehensive Year Book

Rochester Gas and Electric Corp., Rochester, N. Y., has issued a 66-page Year Book to supplement the 1936 annual report.

The book carries many pages of pictures covering every phase of the company's activities. Charts and a folding map pasted to the inside back cover also help to report vividly the year's progress for stockholders.

Gas home-heating sales reached an all-time high in company history during 1936. More than 33 miles of transmission and distribution mains were installed, making gas available to more than 1400 families. The company now has 860 miles of gas mains serving Rochester and its suburbs.

■ ■

Los Angeles Adopts Furnace Rules Passed by A.G.A.

The city of Los Angeles, Calif., has adopted the requirements of the American Gas Association pertaining to the construction, testing, and installation of gas-burning warm-air furnaces, floor furnaces, and wall heaters. The ordinance became effective May 1, and applies to all heating permits issued after that date.

The new ordinance, which revises that previously in effect, includes regulations for the new forced-air unit and requires ample space for adjustments and repairs of floor furnaces.

■ ■

Oregon Co. Puts in Tank

Southern Oregon Gas Corp., Medford, Ore., has installed an additional storage tank of 15,000 gallons capacity in Roseburg. Natural gas is brought in under pressure in tank cars. The company is preparing additional storage space to meet an expected increase in demand.

In HACKNEY Cylinders UNIFORMITY Is A Certainty

Uniformity of wall thickness is but one of many points of precision manufacturing which have won leadership for Hackney Cylinders in the liquefied petroleum gas industry.

Special Hackney welding provides both uniform strength and good appearance. Economical and efficient service results from the accurate balance of light weight and ample strength.

Dependability is assured by over 30 years of container designing and fabricating experience. Write for complete information about Hackney Cylinders.

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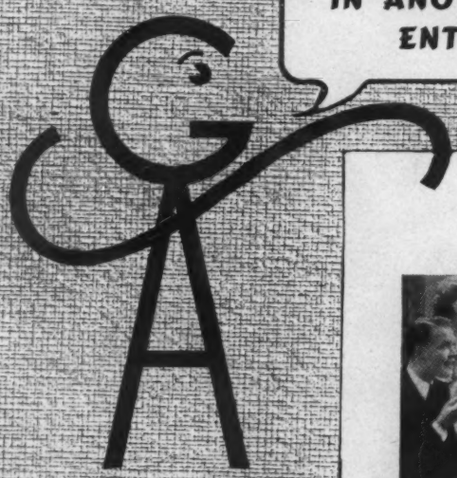
COMMITTEE
J. S. SPAULDING (L. A. G. & E.)
CLIFFORD JOHNSTONE Managing Director Pacific Coast Gas Association

MEET THE JONES FAMILY, FOLKS— IN ANOTHER ALL-GAS PRODUCTION ENTITLED "REFRIGERATION"



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CALIFORNIA HOMES
FEDERATION NEWS
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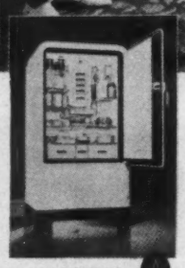

"THE JONES FAMILY" (Twentieth Century-Fox). Left to right: Kenneth Howell, Shirley Deane, Jane Carlson, Billy Mahan, Florence Roberts, Jed Prouty, Spring Byington and George Breen.

Have the Cubed ELECTROLUX THE SERVEL Gas Refrigerator

...I KNEW WE'D ALL ENJOY THAT GAS REFRIGERATOR"

● To see Father now, you'd think the new Electrolux was *his* idea. Further proof of Mother's super-salesmanship, climaxed by this frozen dainty for the family party. ☆ Silently, *without hum or vibration*, the Gas Refrigerator makes desserts "fit for the gods" . . . protects meats and other perishables for days . . . conserves left-overs . . . reduces food bills and simplifies marketing. *All at an operating cost as low as 2 to 3c a day* . . . unrivalled economy. ☆ No moving parts to wear out . . . a tiny gas flame is the only "mechanism." ☆ See new models displayed by your Gas Company or Dealer. Shop, compare features and *hear all types in operation*. You'll understand why millions choose this modern marvel that *freezes with heat*. You, too, will want GAS refrigeration

WATER HEATING • COOKING • HEATING • REFRIGERATION

Gas THE MODERN FUEL

New England Gas Association Holds Divisional Meetings

THREE divisions of The New England Gas Association scheduled meetings late in April. The Industrial Division met on April 23 at the University Club, Boston, for lunch and an afternoon session. H. A. Sutton, assistant to the general industrial fuel representative, Public Service Electric & Gas Co., discussed commercial advertising. Arthur B. Cole, chairman of the Manufacturers' Division, spoke on "This Volume Water-Heating Load." Members visited the Division's co-operative gas exhibit at the New England Hotel Exposition.

The Accounting Division convened at 6 p.m. April 29, at the Gas and Electric building at Malden. Those who read papers and led discussions were Martin J. Coughlin, secretary, The Hartford Gas Co.; Vincent Farnsworth, Jr., assistant auditor, Boston Consolidated Gas Co.; N. B. Macaulay, accountant, Salem Gas Light Co.; and Theodore H. Brown, professor of Business Statistics, Harvard Business School.

The Operating Division, to meet on April 30 and May 1 at the Hotel Kimball, Springfield, booked papers by A. D. MacLean, chief engineer, Pittsburgh Equitable Meter Co.; J. A. Johnston, division highway engineer, Massachusetts Department of Public Works; Lt. Amory H. Waite, Jr., member of the second Byrd Antarctic Expedition; Arthur S. Hall, superintendent, Springfield Gas Light Co. Many other gas men were scheduled to take part in discussions.

■ ■

Seattle Chosen for Convention Of P.C.G.A. in 1937

The Pacific Coast Gas Association will hold its 1937 annual convention in Seattle, Wash., according to the announcement of President James F. Pollard, president of the Seattle Gas Co. Seattle was chosen at a meeting of the Association's Board of Directors in Los Angeles on April 2.

The convention will be held on August 17, 18, and 19. No Northwest Conference of the Association will be held this year. It was to have been held on June 25 and 26 in Seattle.

■ ■

Laclede Gas Light Co. Names Six New Board Members

Six new members of the board of directors of The Laclede Gas Light Co., St. Louis, Mo., were appointed on April 2. Those appointed, all residents of St. Louis, were L. Wade Childress, A. Wessel Shapleigh, W. C. D'Arcy, E. E. Pershall, John Duncan, and Ben F. Pickard, operating executive. Five former members of the board were re-elected.

E. J. BOYER, Minneapolis Gas Light Sales Manager and Mid-west Gas Association president-elect (left), and companion cheer for Minneapolis.

CONVENTIONALLY IN conference are Ed Swenson, Minneapolis Gas Light Industrial engineer; F. G. Slagel, Servel, Inc.; and R. L. Robertson, also of Minneapolis Gas Light Company.

Mid-West Gas Men Elect E. J. Boyer President at Convention in Waterloo

By ANATOL FOMILYANT
News Editor, G A S

E. J. BOYER, sales manager, Minneapolis Gas Light Co., was elected president of the Midwest Gas Association during the first business session of the thirty-second annual convention held in Waterloo, Iowa, April 12, 13, and 14. He succeeds H. M. Smith, assistant manager, Iowa Public Service Co., Waterloo. S. D. Whiteman, Sioux Falls Gas Co., Sioux Falls, S. D., and F. J. Gunther, Lincoln, Neb., were elected as first and second vice-presidents, respectively. R. B. Searing, Sioux City Gas & Electric Co., Sioux City, Iowa, was re-elected secretary and treasurer, a post that he has held for the past eight years.

Lester J. Eck, Minneapolis Gas Light Co.; C. D. Robison, Metropolitan Utilities District, Omaha; H. C. Holder, Council Bluffs Gas Co., and L. E. Osmer, Semet-Solvay Engineering Co., Chicago, were elected to the executive council for three-year terms. C. B. Dushane, Jr., American Meter Co., Chicago, whose term on the council expired with the current convention, was re-elected for one year to succeed R. H. Luscombe, who resigned because of transfer from the Midwest.

A. C. Rathkey, Iowa Public Service Co.; E. H. Vieregg, Central Power Co.; F. L. Banner, Minneapolis-Honeywell Regulator Co.; A. H. Abbott, Northern States Power Co., and W. J. Barber, Metropolitan Utilities District, Omaha, were named representatives for the Technical, Accounting, Manufacturing, Industrial and Commercial Sections of the American Gas Association.

Major Alexander Forward, managing director of the American Gas Association, was presented at the opening session of the conference. His address on "Side Lights of Industry Affairs" offered significant facts pertaining to the progress of the industry and showed the strides being made in the sale of gas for industrial and commercial use.

With a few exceptions, the advance program as published in the April issue of G A S was carried through. At the afternoon session on the first day, which was devoted largely to the advertising and selling of gas cookery, F. A. Mueller of the Metropolitan Utilities District, Omaha, presented the paper prepared by C. D. Robison of the Utilities District on "Changes Occurring in a Distribution System as a Result of Changes in Characteristics of Gas Supplied." On the afternoon program of the second day, which centered around water heating, R. J. Caniff of Ruud Manufacturing Co. occupied the place accorded to J. H. Fagan of J. H. Fagan Co. Mr. Caniff gave many practical slants concerning the sale of water heating.

One of the highlights of the convention was the address by the Mystery Chef on the second day. He spoke on the topic, "Gas Still Stands Unchallenged."

The annual banquet was held at the "Tavern on the Green." Registered at the convention were 205 gas men, a number exceeded only by the attendance last year in Minneapolis.

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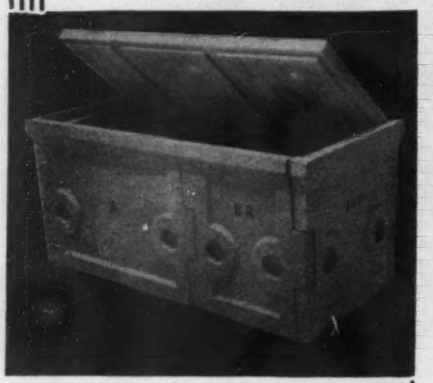
for CURB METERS



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Furnished in combinations suitable for single and multiple set-ups, high and low pressure. **Two star features: 1—Boxes may be lengthened without removal. 2—Knockouts for pipe connections and break-away pipe slots and grooves . . .** Also round curb boxes in varying depths.

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Exclusive with Minneapolis-Honeywell

ONLY Minneapolis-Honeywell can offer the control performance made possible by the exclusive Series 10 Circuit. That is one important reason why it pays to standardize on this superior line of controls. In addition your service department can operate more efficiently and will have fewer calls, and your stock room will have to handle only one line to fill all control requirements. Minneapolis-Honeywell Regulator Co., 401 East 28th Street, Minneapolis, Minn.

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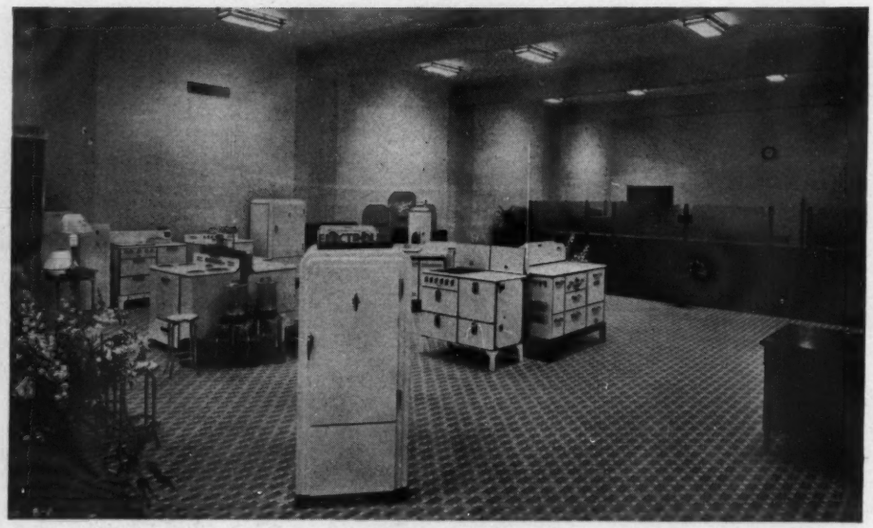

Display floor in the new office of Coast Counties Gas and Electric Company, Santa Cruz, California

Coast Counties Gas and Electric Co. Opens Modern Building at Santa Cruz

BETWEEN 3000 and 4000 visitors were guests of the Coast Counties Gas and Electric Co. at its recent Open House, held to celebrate the completion of the new district and general office building in Santa Cruz, Calif. Visitors passed through the display floor, where they had an opportunity to see the latest in modern appliances, and were shown through the offices of the company, where employees were on hand to explain the various functions of the different departments.

H. L. FARRAR

In the general offices, which also include those of the Natural Gas Corp. of California, many saw a billing machine in operation for the first time and became familiar with the general handling of this department.

Visitors were also taken to the basement to view the complete gas heating and ventilating equipment, consisting of two 400 Electrogas furnaces, which filter the air before delivering it into the various offices. For summer ventilation purposes it is possible to operate the blower units with the furnaces off and circulate approximately 18,000 cu. ft. of air per minute through the offices. The latest type Uni-flow directional air supply registers were used throughout, with high side-wall mounting. Provision was made to take in about 50 per cent fresh air at all times and recirculate the balance.

Many of the offices in the building are entirely inside and this complete heating and ventilating system makes it possible for them to be kept at the correct uniform temperature, with plenty of clean, fresh air circulating through the building at all times.

Equally careful attention was given to providing different types of lighting in the various offices, with a variety of types of fixtures in use for demonstration purposes.

Designed by Alben Froberg of Oakland, the new building is thoroughly modern both in exterior and interior finish. Special emphasis, according to President H. L. Farrar, was laid upon the installation of equipment contributing to the health and comfort of employees. These installations also furnish a practical working display for the use of local contractors in demonstrating such equipment to customers.

Other new buildings recently completed by this organization include a new district office at Los Banos for the Coast Counties Gas and Electric Co. and at Avenal for the Natural Gas Corp. of California.

■ ■

Court Okeys Reorganization

The reorganization plan of Missouri Gas and Electric Service Co., Lexington, Mo., has been approved by the federal court, and new securities are being issued in accordance with the plan, according to A. G. Beisenherz, secretary-treasurer.

SEASON of cleaning and renovating . . . season, also, of bright, new "model homes" with their supremely modern kitchens, laundries, baths. A good season, we think, to push that indispensable aid to cleanliness, the Automatic Storage-type Water Heater. And so we will. Fortified by our advertising, your own efforts along this line can hardly fail. Details of our spring Water Heater promotion will be found in the May Dealer Letter. Read—plan—then ACT!

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THOUSANDS Brought to LIFE!

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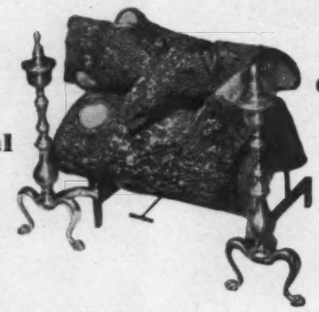

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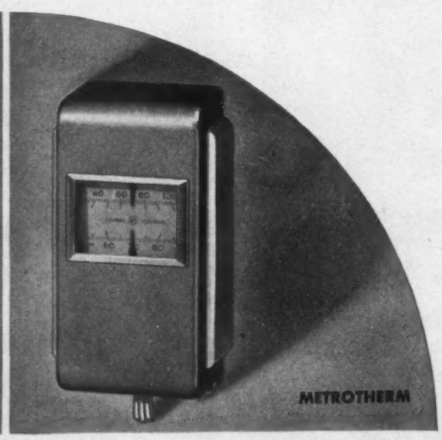

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Oklahoma Utility Convention Draws 600 to Tulsa

Six hundred delegates attended the nineteenth annual convention of the Oklahoma Utilities Association at Tulsa, Okla., March 22 and 23. Ninety-eight gas companies, serving 323 towns, were represented.

A program of diversified interest included addresses by J. F. Owens, president, Oklahoma Gas & Electric Co., Oklahoma City; Bernard F. Weadock, vice-president and managing director, Edison Electric Institute; E. E. Stoval, Lone Star Gas Co., Dallas, Texas; L. B. Denning, president, Lone Star Gas Co., Dallas; C. N. Robinson, vice-president, Public Service Co. of Oklahoma, Tulsa; W. E. Schooler, editor and publisher, *Hugo Daily News;* Miss Mildred Clark, Oklahoma Natural Gas Co., Tulsa; Roy E. Hayman, Oklahoma Gas & Electric Co.; Dr. Paul B. Sears, University of Oklahoma; Frank B. Long, vice-president, Oklahoma Natural Gas Co.; C. A. Breitung, vice-president, Southwest Gas Utilities Corp., Ada; Charles Evans of the Arkansas Utilities Association, Little Rock, Ark.; and J. Y. Wheeler, Oklahoma manager, Community Natural Gas Co., Dallas.

J. P. Arnold, president of the Oklahoma Utilities Association, who is director of public relations for the Public Service Co. of Oklahoma, presided at the first session, assisted by J. Y. Wheeler, vice-president of the association and Oklahoma manager of the Community Natural Gas Co., Dallas. Mr. Arnold delivered the president's address at this session. Fred W. Insull, president, Public Service Co. of Oklahoma, presided at the convention dinner on March 22. Miss Ruth Canaday, assistant secretary of the Oklahoma Natural Gas Co., Tulsa, presided at the luncheon for women on March 23.

■ ■

Air Conditioning Men Meet at U. of Wisconsin

A conference on air conditioning and automatic heating was held on April 21, 22, and 23 at the University of Wisconsin, Madison. A manufacturers' exhibit was held simultaneously.

The afternoon session of the second day was devoted to air conditioning and automatic heating with gas. E. D. Milener, secretary of the Industrial Gas Section, American Gas Association, spoke on "The Gas Industry's Position in Relation to Air Conditioning and Automatic Heating." "Sales Arguments for Gas Heating in the Air Conditioning Field" was the topic discussed by B. A. Johnson, manager, sales engineering, Peoples Gas Light & Coke Co., Chicago. "Comparative Merits of Direct and Indirect Fired Air Conditioners" was the topic of Platte Overton, chief engineer, The Furblo Co., Hermansville, Mich.

■ ■

Hayden Given Scholarship

James Grant Hayden, Jr., a graduate student in the Department of Gas Engineering, The Johns Hopkins University, has been awarded the scholarship of the American Gas Association at that university. A. G. A. maintains a second scholarship at Purdue University. Both are made possible by the income from the Trustees Gas Educational Fund.

Renewed Pipe Line Activity Seen During 1936-37

(Continued from Page 20)

Ajo, Casa Grande, and Chandler (*GAS*, Oct., 1936, p. 58). Combined population of the four cities is over 10,000. Further construction by the El Paso company included two compressor stations near Douglas and Benson in Arizona and the addition of 9120 hp. to stations in New Mexico and Texas.

Pacific Coast Activities

Very little construction was on the 1936-1937 program of Pacific Coast utilities. San Diego Consolidated Gas & Electric Co. connected the town of Escondido with 15 miles of small diameter pipe. Principal pipe line construction during the year was carried on by the Industrial Fuel Supply Co. and the Southern California Gas Co. of Los Angeles with the completion of lines adding to the facilities carrying gas from the Shell Company's Ten Sections Field to the main lines to Los Angeles. Southern California Gas Co. is currently planning a seven-mile 10-inch loop to parallel the existing line skirting Elk Hills, a seven-mile 10-inch loop to parallel the existing Kettleman Hills Lemoore line, and a 13-mile 22-inch loop from the Newhall station north to the end of the present 22-inch line. In addition about 10 miles of 4- to 8-inch pipe will be laid in various fields in the San Joaquin valley.

In the foregoing account an attempt has been made to outline briefly the natural gas construction activities as they occurred and are now progressing in different sections of the country. From the account and from the tables it is readily seen that the greatest area of activity during the past year has been in the Middle West, in Michigan, and along the transmission lines between the Texas Panhandle and Detroit. Indications point towards greatest expansion activities for 1937-1938 in this same territory.

■ ■

Cincinnati Utility Publishes Flood Pictures Edition

After the disastrous floods that devastated the Ohio Valley last winter, Union Light, Heat & Power Co., Cincinnati, Ohio, published a special rotogravure edition of its house organ, *The O-K News*, telling the story of the flood with pictures.

The "inside" facts on how the utility company met the emergency are included in this 24-page record of one of the worst catastrophes in the nation's history.

The edition was distributed free.

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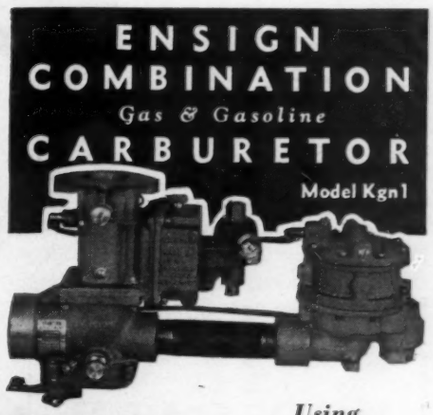

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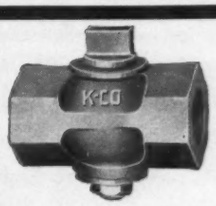

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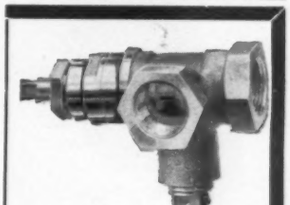

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Engineering and Soil Corrosion

(Continued from Page 24)

The real purpose of pipe line maintenance crews, however, is to repair leaks, and to discuss the pipe corrosion problem in a sensible way it is necessary to talk about leaks. Such discussion does not imply an admission of the weakness of pipe lines.

It may be argued that leaks on pipe lines occur without rhyme or reason, that to attempt to predict their occurrence is utterly hopeless, and that any formula could not possibly be correct. On the contrary, anyone who has studied data on leaks knows that the occurrence of leaks on a large system over a period of years shows striking regularity and hence is a reliable and true measure of the effect of corrosion on the pipe line.

4. *Pit Depth-Area Relation.* Whenever a ferrous metal surface is exposed to the soil, a large number of pits develop which vary in depth. Other things being equal, the larger the exposed area, the deeper the deepest pit is likely to be. Or, if a large number of equal areas are exposed to the same soil for the same time, the average of the depths of the deepest pits on these areas will actually be less than the average of the depths of the deepest pits on large areas, exposed in the same way.

From pit measurements on the Bureau of Standards specimens and on pipe lines, Scott (3) reached the conclusion that over a limited range of area, the relation between pit depth and area is expressed with sufficient accuracy for practical purposes by the equation:

$$P = bA^a$$

where

P is the depth of the deepest pit on the area A,

a = a constant, depending on the conditions of exposure,

b = a constant, the mean of the depths of the deepest pits on unit areas.

Values of the constant a ranged between 0.15 and 0.36.

5. *Pit Depth-Time Relation.* It has been assumed in some cases that pit depth is proportional to time, but the previous explanation of the corrosion process indicates that in general this could not be true. Here again a good source of information is the Bureau of Standards results.

By plotting the logarithm of the average pit depth on a given area against the logarithm of the time, curves were obtained which were approximately linear, i.e., they conformed in general to the equation:

$$P = kT^n$$

where

P = depth of the deepest pit at time T.

Taking logarithms of both sides,

$$\log P = n \log T + \log k$$

Hence n = slope of the line and log k = intercept on the log P axis.

With the exception of the curves for a few soils in which the data were so erratic that little regularity could be observed, the relation given above expresses the pit depth-time relation satisfactorily. A few of these curves are shown in Fig. 1.

The values of n and k together with their standard deviations have been calculated from the Bureau results. When the soils in the test are arranged in order of decreasing values of n as has been done with the seven soils in Fig. 1, it is at once clear that the aeration of the soil is the principal factor determining the value of n. The poorly drained soils have large values of n (as high as about 0.9) and the well drained soils have small values of n (as low as 0.05). Where

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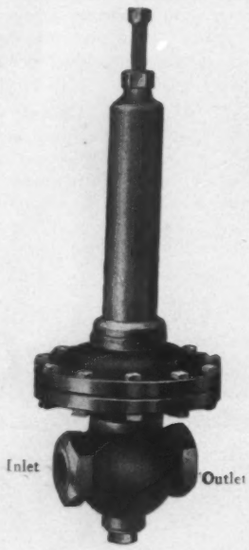

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n is in the neighborhood of 0.1 the pit depths increase very slightly after the first two years' exposure, while in the extremely poorly drained soils the pit depths are almost proportional to the time. This is in conformity with general pipe line experience in that the places which usually give the most trouble are the poorly drained places, although it should be understood that the drainage is only one of the factors affecting the corrosion rate. The above facts are also in conformity with the explanation of the corrosion process already described.

6. *Pit Depth, Area and Time Relations.* The equation $P = bA^a$ has been chosen with certain qualifications, already pointed out, to represent the relation between pit depth and area, the constant a being independent of time. The equation $P = kT^n$ has been chosen to represent the relation between pit depth and time on a definite area.

P is therefore proportional to the product of the two right-hand members of these equations, i. e.,

$$P = kT^nA^a$$

where k is the average value of the depth of the deepest pit on unit area at unit time.

If in the above equation we put $P = t$, the pipe wall thickness, we have a relation between T and A, in which A becomes the area associated with a puncture of the pipe wall. Putting $A = \frac{1}{N}$, where N is the number of punctures per unit area, we have:

$$N = \left(\frac{k}{t}\right)^{1/a} T^{n/a}$$

This is now a relation between the number of leaks per unit area, as a function of the time, in terms of certain constants k, n and a. If the relations upon which the equation is based are correct, then the pipe line operator has an accurate picture of the corrosion of the pipe line in terms of leaks. The effect of the soil on the pipe line is defined in terms of three constants, which tell the operator all that he needs to know about the behavior of the line.

If the average cost of a leak and the price of steel per ton are known, the equation permits an exact calculation of the most economical pipe wall thickness for a given set of conditions. Hence it permits one to decide whether he should combat corrosion with pipes of thicker walls or with coatings and cathodic protection. It is also possible to determine how many leak clamps should be on a given stretch of pipe line before the section should be reconditioned, provided reconditioning and leak costs are known. But like every other engineering formula, it should be considered as a guide to the judgment, rather than as a method to be used blindly.

Pipe Coating Specifications

The usual method for specifying a bituminous material is by means of the A.S.T.M. tests, such as softening point, ductility, penetration, etc. While these tests are suitable for defining the properties of bituminous materials for many purposes, they do not provide a measure of the value of a bituminous material for protecting pipe lines. The following is a brief discussion of some of the properties of bituminous materials which are of importance when these materials are used for pipe coatings.

1. *Adherence to the Pipe Surface.* The adherence of the coating material to the pipe surface is not merely a

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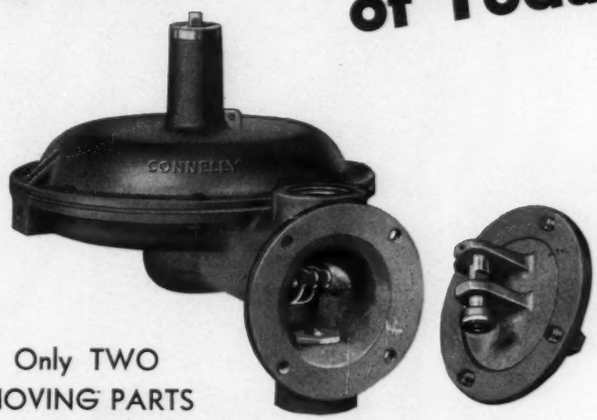

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question of securing a suitable primer and proper application. Neither is it simply a matter of obtaining a suitable bond at ordinary temperatures. The bituminous material should not flow off the pipe in the hot sun nor should it develop cracks nor fall off the pipe if the pipe is left exposed on a cold night. How well a bitumen will adhere to a pipe surface depends largely on the properties of the bitumen.

Tests with steel panels, primed and coated with the bitumen, may be used as the basis for specifications. The temperatures chosen in the specification should depend upon the locality and the season in which the bitumen is to be used. The methods for making these panel tests have been described elsewhere (4). This kind of test is capable of giving some surprising results on bituminous materials that otherwise appear to be practically identical.

2. *Mechanical Characteristics of the Coating Material.* It is a well established fact that the principal fault of many coating materials is their tendency to flow. One might think that the penetrometer would be a suitable measure of this property, but there is ample evidence from the results of field coating tests to show that it is not. The reason is that the load on the needle is too great and the time is too short. What is needed is a test which measures the tendency of the material to flow under a small pressure exerted over a long time.

A device has been built to measure the indentation of asphalt floor tile which satisfies this requirement (5) and tests have been made which show that it will give widely different results with the usual pipe coating materials. Of course a pipe coating material could not be expected to pass the same indentation requirements as an asphalt floor tile, but the proper requirements could be easily determined.

3. *Moisture Absorption.* Some bituminous materials deteriorate rapidly in the soil, especially when exposed in thin layers. Those materials which deteriorate rapidly absorb large amounts of water. Practically all kinds of waterproofing materials absorb more or less water and bituminous materials are no exception.

Several investigators have measured the rate at which bituminous materials absorb water, using somewhat different methods for preparing the specimens and extending the observations over different periods. Those materials which absorb small amounts of water retain original appearance over long periods. The more absorbent materials become changed in various ways. The volume usually increases, the material may become spongy or may crack or wrinkle or show other peculiar changes which are characteristic of the material. In any case it seems reasonable to describe this change as a gradual deterioration in which the coating material gradually loses its protective qualities.

Moisture permeability or moisture absorption tests, or both, probably afford the best means for learning something about the chemical stability or durability of bituminous coating materials, and thus for selecting the most suitable materials, from the standpoint of stability.

■ ■

Wisconsin Power and Light Opens Speedway Contest

Wisconsin Power and Light Co., Madison, Wis., is using a Spring Speedway contest to stimulate sales activities. Cash prizes totaling $300 are offered, with extra bonus for extra laps and trophy awards for the winners. The contest started on March 15 and will continue to May 25.

To explain the details of the speed classic, the company issued a large pamphlet.

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Payne Furnace Names Keber Wholesale Sales Manager

JOHN H. KEBER has been appointed wholesale sales manager for Payne Furnace & Supply Co., Beverly Hills, Calif. Mr. Keber has been connected with the Payne company for about eight years. During that time he has served in various capacities, gaining a thorough knowledge of Payne products and matters connected with the merchandising of gas-fired heating appliances. He is widely acquainted in the field.

J. H. KEBER

As wholesale sales manager, Mr. Keber will be in charge of all matters pertaining to wholesale outlets and sales personnel.

■ ■

Chicago Power Exposition Scheduled for October

The Chicago Exposition of Power and Mechanical Engineering will be held October 4-9, 1937, at the New International Amphitheater in Chicago. It will bring to the Middle West a comprehensive exposition of machinery, apparatus, and instruments used in generation of power, its control, transmission, and use; also the most up-to-date mechanical engineering equipment designed to use power in the improvement of products and operation.

Principal classifications of exhibits will include the following: combustion, electric power generation and transmission, hydraulic, control, insulation, mechanical power transmission, materials handling, plant maintenance, and prime movers, including steam, gas, oil and Diesel engines.

■ ■

Panhandle Eastern Uses 17,000 Dresser Couplings on 8 Loops

For use on their new looping program in Kansas, Missouri, and Illinois, the Panhandle Eastern Pipe Line Co. has ordered a total of almost 17,000 Dresser couplings, according to M. N. Davis, vice-president of the S. R. Dresser Manufacturing Co., Bradford, Pa.

Approximately 14,500 of these are in the 24-inch O.D. size and the remainder are in the 22-inch O.D. size. In addition, nearly 250 Style 40 Long Sleeves in similar sizes are being supplied. Total mileage of the eight loops to be constructed will amount to about 216 miles of 24-inch and 39 miles of 22-inch pipe.

■ ■

Ward Heater Adds to Sales Staff in Eastern Area

The Ward Heater Co. of Los Angeles, Calif., which is expanding markets for Ward floor furnaces into eastern territories, has added two new sales representatives to its staff.

In Pittsburgh, Pa., Ward will be represented by H. C. Sanderson, at 207 Fulton Building. Mr. Sanderson will handle Ward sales in western Pennsylvania, West Virginia, Maryland, and Eastern Ohio. He has been a manufacturers' representative, with headquarters in Pittsburgh, since 1922.

In Kansas City, Mo., Ward floor furnace sales are now being handled by J. H. Stubbins, who will cover Kansas and western Missouri for Ward. Mr. Stubbins is a heating man of long experience. His headquarters are at 300 East 68th Terrace, Kansas City, Mo.

Ward also has direct representation in Dallas, Chicago, and San Francisco. In Southern California retail distribution is handled largely by the factory sales force. The company plans to place additional direct representatives in key cities to contact appliance dealers and the merchandising executives of the various gas utilities.

R. B. Elliott Goes to Portland As Sales Promotion Head

ROBERT B. ELLIOTT has been named to the position of manager of sales promotion of the Portland Gas & Coke Co., Portland, Ore., according to an announcement by John J. Winn, Jr., commercial manager.

Mr. Elliott goes to Portland from Miami, Fla., where he was sales promotion manager of the Florida Power & Light Co. He is a graduate of the University of Florida and joined the utility company as a salesman. Besides taking charge of sales promotional activities, he will direct the home service department and assist in the major merchandising programs in co-operation with gas appliance dealers.

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New Ideal Hi-Speed Model Pipe Cleaning Machine "Cleaning Up" for Oklahoma Operator.

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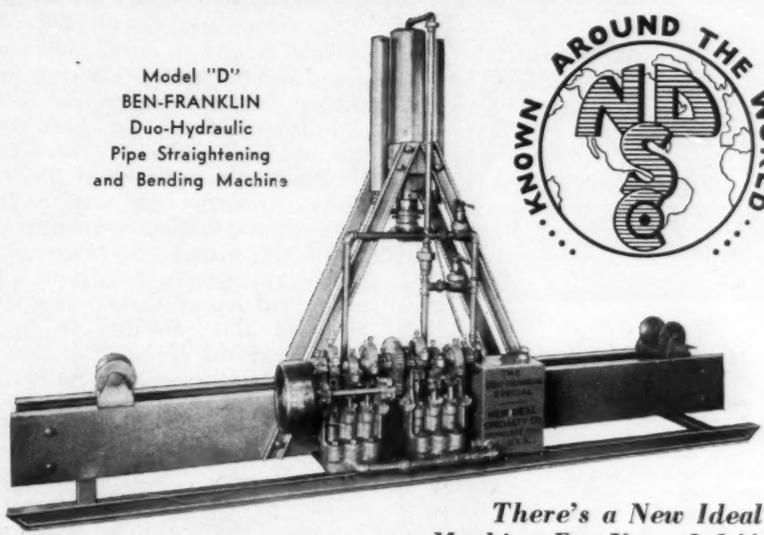
Model "D" BEN-FRANKLIN Duo-Hydraulic Pipe Straightening and Bending Machine



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▲
Oklahoma Natural Gas Corp.'s Quinton Compressor station equipped with industrial unit heater, enclosed in small steel building in near left foreground.
▼

Engine Room Heating at Oklahoma Natural's Quinton Compressor Unit

By J. C. ALBRIGHT, Staff Correspondent

WHEN Oklahoma Natural Gas Co., Tulsa, Okla., built a compressor station in the Quinton gas field recently, the question of engine room heating was considered from several angles. Ordinarily, the buildings housing the compressors have been heated by steam. When the stations have been small, the steam has been generated in the usual type of oil field boilers but, when large, in an independent, specially constructed boiler house. The latter naturally requires considerable attention, and demands a large original investment.

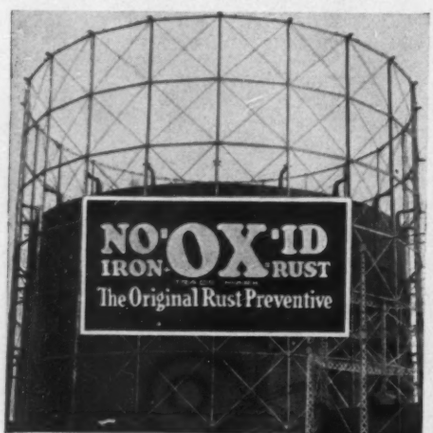
The compressor station constructed in this field was erected for emergency pumping of gas during exceptionally cold days when the demand exceeded the supply furnished by the original rock pressure. The Quinton station now contains four Type XII Cooper-Bessemer gas engine driven compressors, with compressor cylinders 7½ inches in diameter, designed to compress the gas to a pressure considerably higher than is now required. Gas produced in the field has a natural pressure of 300 lbs., and a flowing pressure of 190 lbs. It is taken in through the compressors at that pressure and compressed sufficiently so that it will flow through feeder lines to Tulsa and vicinity.

The power cylinders are of the modern, inverted exhaust type, instead of carrying the exhaust down through the floor and outward to more or less conventional mufflers beside the building. Fifteen-inch iron jackets were supplied for the exhaust pipes extending through the roof of the building. Weather shields were attached to the upper ends and were removable so that outside air might be shut off. Silencers or mufflers of the usual type were fastened to the upper ends of the exhaust stacks, which in turn were attached above the tops of the exhaust pipe jackets.

The building erected to house the compressors is a corrugated steel-covered unit, made by the Stefco, 32 ft. wide and 80 ft. long, 12 ft. from the floor to the first chord. Building ventilators of the usual type were installed on the ridge of the building so that heated air during summer months might escape and help to maintain a lower temperature at that time. These ventilators have shutters to block off the air escape in winter and while the heating unit operates.

The circulating equipment was furnished by Surface Combustion Corp. It is called an industrial unit heater and has a capacity of 400,000 B.t.u. input, with the blower handling 5,200 cu. ft. of air per minute. Electricity is utilized to drive the blower, which has a 1 hp. motor attached to it, with power generated on the premises with an 8-cylinder automobile engine and generator utilizing gas for fuel through a gas carburetor.

The duct system for handling and conveying the air which heats the building includes a hot air duct 20 inches by 40 inches leading from the blower to the building. Inside the engine room this duct branches two ways, as the blower assembly was located at the approximate center of the building. The two ducts are reduced in size to 8 inches by 20 inches to tie into the tops of the exhaust jackets. Cold air is removed from the floor of the building through four



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vents attached to a circular steel duct, 24 inches in diameter placed in a concrete ditch beside the building and connected to the intake side of the blower unit.

The action of cold air returning to the blower from the floor of the building, and air from the blower flowing downward through the steel exhaust pipe jackets forces the heat against the engines and across the floor of the building. The results of this installation have been that the temperature during the coldest weather experienced in January, 1937, when the thermometer hovered around 0° F., did not drop below 50° F. on the inside of the building. This temperature is considered sufficient to maintain fluidity of all lubricating oil and to prevent discomfort for the operator.

The cost of the installation was $1,046, including the following:

Duct System	$ 400.00
Blower Building	160.00
Blower and Motor ...	486.00
Total	$1,046.00

With no boiler to operate, the compressor station can be and has been operated when necessary for gas transmission by only one operator, who lives at the station. In starting the unit up when gas demand requires, one of the roustabouts on the lease is called to help spot the engines and help turn in the gas.

■ ■

Model "110" Ditcher Built By Cleveland Trencher Co.

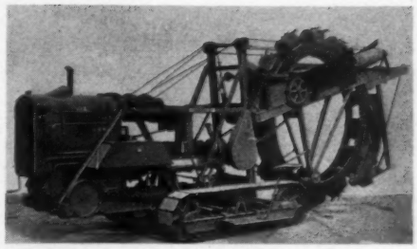
THE Cleveland Trencher Co., Cleveland, Ohio, has added to its line of trenching and ditching equipment the Cleveland "Model 110." The "Model 110" is constructed along the patented design of full crawler ditchers, originated by this manufacturer. It is especially built to meet vigorous field conditions.

The trench cutting capacities are from 10½ in. to 23 in. wide and to a maximum of 5½ ft.

By simple lever-shifting, a multiplicity of digging and traction speeds, in combination with different wheel speeds, are available to the operators. The digging speeds range from 1½ in. to 33 ft. per minute. The top road speed is 3 m.p.h.

Power for the Cleveland "Model 110" is furnished by a 325 cu. in. gasoline engine, developing 38.5 hp. at 1000 r.p.m.

Features found in this ditcher are unit-type construction; steel enclosed,



dirt sealed drives; differential brake steering; quick-shift arc-type conveyor; close-up view of digging action from operator's platform; use of over 90 anti-friction bearings; usage of alloy, heat-treated steels, cutting units and wheel-mounted digging buckets of patented, rigidly-mounted design that insure maximum digging capacity with least power expenditure.

Total weight of the "Model 110" is less than 6 tons. It can be loaded or unloaded in 10 or 15 minutes on a specially built trailer, assuring economy and speed in transportation.

■ ■

Beck and Whiteley Appointed

General Petroleum Corp. of California, Los Angeles, announces the appointment of E. W. Beck as manager of purchases and P. J. Whiteley as assistant manager of purchases.

One man, standing in a comfortable position, can exert a pressure of 40,000 pounds on the pipe clamp.

You Can PUSH PIPE FASTER and EASIER
With a Greenlee Hydraulic Pipe Pusher

This powerful, compact tool offers you a real short cut on underground installations. It reduces time and labor expense by eliminating much trenching, back-filling, etc. It saves tearing up lawns and pavements and requires only one man to operate the levers.

With the Greenlee, all that is needed is a trench long enough to accommodate the pusher with a section of pipe. As the pressure is applied by pumping the handles, the power unit moves forward on a notched steel base, forcing the pipe through the earth. Considerable time is saved, since the pipe clamp is changed only every 4 to 7 feet, depending on the length of base used. It will push pipe up to 4-inch, has eight speeds for varying soil conditions and will exert a pressure of 40,000 pounds on the pipe clamp.

Why not investigate this improved method of pushing pipe for all underground installations? Complete information will be sent gladly and without any obligation to you. If desired, we shall also be glad to furnish names of users.

GREENLEE TOOL CO., 1700 Columbia Ave., ROCKFORD, ILLINOIS

13th Southwestern Gas Measurement Short Course in Successful Meeting

THE thirteenth Southwestern Gas Measurement Short Course, conducted by the College of Engineering, University of Oklahoma, at Norman, on April 20, 21, and 22, drew an attendance of 576 gas measurement men from 26 states and one foreign country. It was the most successful and beneficial short course yet held, in the opinion of all who attended, according to Kate Niblack, acting secretary.

Sponsors of the course, who assisted in its preparation and presentation, are Corporation Commission of Oklahoma, Texas Railroad Commission, Oklahoma Utilities Association, Natural Gas Department of the American Gas Association, and Natural Gasoline Association of America.

Several of the papers delivered at the various sessions will be given treatment in subsequent issues of *GAS*. Speakers included members of the University faculty, gas company men, and representatives of manufacturers of metering equipment. Sixteen manufacturers maintained exhibits during the short course.

Prizes for the best reports submitted after the 1936 short course on "What I Learned at the 1936 Meter School" were awarded as follows:

First prize: George Thurber, Jr., Arkansas-Louisiana Gas Co., Shreveport, La. $15.00.

Second prize: R. F. Downey, Lone Star Gas Co., Dallas, Texas. $10.00.

Third prizes: Dean Bruce, Oklahoma Natural Gas Co., Muskogee, Okla.; Edward S. Doerr, Lone Star Gas Co., Dallas, Texas; E. C. McAninch, Oklahoma Natural Gas Co., Oklahoma City, Okla.; J. M. Howard, Kansas Power & Light Co., Manhattan, Kan.; Dan W. Yarberry, Dallas Gas Co., Dallas, Texas. Five dollars was awarded each third place winner.

E. E. Stovall, Lone Star Gas Co., Dallas, served as general chairman this year. Gilbert Estill, Oklahoma Natural Gas Co., who served as program chairman for the 1937 school, was chosen general chairman for the 1938 short course.

Gavels of rosewood with a sterling silver name plate and an inlaid walnut box were presented to each member present who had served as chairman of the General Committee.

■ ■

Safety Control Designed For Gas Governors

(Continued from Page 95)

This safety control has been so designed that failure of any gas line, joint, or connection causes the governor to close off instead of dropping open as it would under previous operating conditions.

This device will regulate the governor to a small variation of outlet pressures and has a possibility of eliminating the necessity and use of auxiliary control equipment.

■ ■

R. O. Cox, Chief Meter Clerk For Lone Star, Wins Prize

R. O. Cox, chief clerk in the gas measurement department, Lone Star Gas Co., Dallas, Texas, tied for third place in a contest conducted by Forbes Magazine for the best letter on "Why I Like to Work for My Company."

In recognition of his accomplishment, the company gave Mr. Cox a trip to New York City that he might attend the banquet at which the prizes were presented.

Mr. Cox joined Lone Star in 1926 and has been chief clerk of the gas measurement department since 1930. He is a graduate of Texas A. and M.

■ ■

Western United Installations 45 Per Cent Ahead of 1936

Gas merchandise installed by Western United Gas & Electric Co., Aurora, Ill., during the first two months of 1937 was 45 per cent over installations for the corresponding period of 1936. Gas refrigerators were 90 per cent ahead of 1936 installations, and gas range installations were 100 per cent ahead of the 1936 figures.

A spring gas range sale was conducted during April. In March, the company featured a water heater campaign.

■ ■

Oberlin Grants Franchise To Kansas Pipe Line Co.

A franchise has been granted by the city of Oberlin, Kan., to the Kansas Pipe Line & Gas Co. to construct and operate a natural gas transmission and distribution system into and in the city of Oberlin. Service will be ready by fall, press dispatches report.

The line to Oberlin will come from the present terminus at Norton to Norcatur and Oberlin. Later, it is reported, the line will be extended south to Hoxie, then east to the main line at Stockton.

The Goodman Stopper

The Reliable Shut-off for Street Mains

Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, N. Y.

Pac. Coast Rep.: C. B. Babcock Co.
475 Eleventh Street
San Francisco, California

The Big Name in
HEATING
and AIR
CONDITIONING
is
MUELLER-MILWAUKEE

Robertshaw's "Thermal Eye" Shows When Oven Is Hot

THE last guess-work in oven cooking has been eliminated, according to the Robertshaw Thermostat Company, which recently placed on the market a new heat control with the "Thermal Eye."

Heretofore oven heat controls have had no device whereby the operator of the oven could tell, without looking in at the oven burner, when it had reached the pre-heat temperature as required by the recipe.

In the new Robertshaw control, when the temperature of the oven reaches the temperature for which the dial is set, a red signal moves into view in the window of the "Thermal Eye," letting the user know that the oven is ready for the food.

From the service man's standpoint, an even greater advancement has been made in these new controls. The valves for adjusting the oven burner by-pass and the safety pilot are placed right on the front of the control itself, or on what is called the bezel. Consequently, the fitter, after having installed the range, need only pull spring caps out of the holes marked P and B exposing the adjustment valves for these two important adjustments.

A thermostat of improved design for gas-heated coffee urns, which, it is claimed, saves from ten to twenty per cent on the cost of operating such urns, is now being marketed by Robertshaw. The new controls can be obtained as standard equipment on new urns and are also available for easy installations on urns now in use, the company states.

The device regulates the flow of gas to the urn burner and can be set to control the temperature of the urn to the ideal temperature for brewing coffee and preserving its flavor and aroma over long periods of time. It also is claimed that the new thermostat prevents the boiling of coffee and the generating of steam.

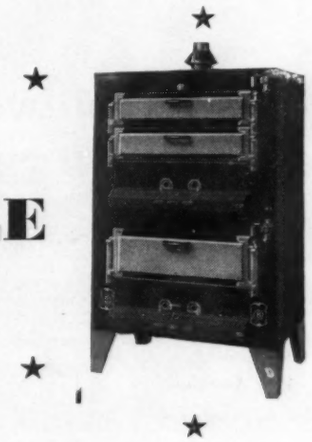
The Robertshaw company is also offering this new control in models for steam-heated urns and for other equipment such as steamtables, bake ovens, rinse tanks, deep fat fryers and gas range ovens.

Blaw-Knox Co. Buys Power Piping Co. of Pittsburgh

The Blaw-Knox Co. has acquired the property and business of the Power Piping Co. of Pittsburgh, W. P. Witherow, president of Blaw-Knox Co., has announced.

The Power Piping Co. was organized in 1916, and has been engaged in the design, manufacture, and erection of piping for power plants, oil refineries, sewage plants, water works, and industrial plant usages for all pressures and purposes. In 1934, it added a sprinkler division.

The business will now be operated under the name of Power Piping Corp. William V. Quartz will continue in charge.



NOTABLE GAINS

IN VOLUME OF GAS SOLD FOR COMMERCIAL PURPOSES IN 1936

by BOTH NATURAL AND MANUFACTURED GAS COMPANIES

Preliminary estimates indicate a 22.4% gain in volume of gas sold for commercial and industrial purposes—and a 16.1% gain in revenue for the gas industry from this class of business.

The year just past was also a notable one for the famous BLODGETT TWO-IN-ONE OVENS. New gas companies featured them (with excellent results) in their sales programs. Other companies who have been handling Blodgett Ovens for years—and know their value (as a builder of desirable load and of worthwhile prestige)—put more effort behind Blodgett Ovens than in previous years.

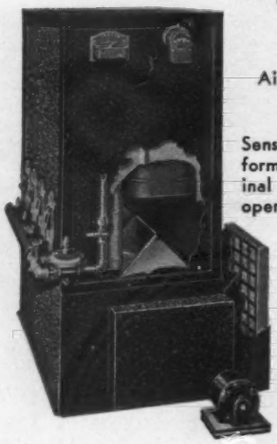
BLODGETT OVENS are thoroughly in step with modern ideas of economy and fuel saving. Tell the easy-to-tell, easy - to - sell BLODGETT story to hotels, restaurants, bakeries, hospitals, schools, clubs and churches in your city. This story will help you make 1937 an even more profitable and notable year for the gas industry. Ask for the complete details!

The G. S. BLODGETT CO., Inc.
BURLINGTON VERMONT

Manufacturing the most complete line of portable ovens on the market for baking and roasting. Members of A.G.A.

NEW LOW COST

FRASER



Gas Furnace and Winter Air Conditioning System

Sensational in performance, low original cost and low operating cost.

Write for details today.

Manufactured by

Fraser Furnace Company

Stockton, Calif.

Distributed by

H. R. Basford Company

San Francisco Los Angeles

In Los Angeles

it's the

HOTEL CLARK

Fifth and Hill

555 Rooms-Baths

From $2.50 PER DAY

Famous for Good Food from Coast to Coast

RIGHT downtown in the center of things. Easy chairs, sleep-inspiring beds, large rooms with luxurious fittings.

P. G. B. MORRISS
Manager

GAS-TLY GHOST

While a group of Milwaukee theater goers enjoyed the show, "The Phantom Servant", a modern gas range, cooked a complete oven dinner. At right is the presentation of the dinner to a lucky spectator.

Milwaukee Utility's "Phantom Servant" Thrills Motion Picture Audiences

COOKING magic, possible with a modern automatic gas range, is demonstrated in a novel and convincing way in "The Phantom Servant," presented before motion picture audiences in territory served by Wisconsin Public Service Corp., Milwaukee, Wis.

A modern gas range is installed on the stage at the right. Before the demonstration, the local home service representative of the company prepares for cooking a complete oven dinner—meat, potatoes, vegetable, and dessert. Just before the matinee program is to begin, a spotlight is thrown on the range, and a talking film entitled "The Phantom Servant," is shown on the screen.

The picture explains that a phantom servant has been placed on the stage and that the home service representative of the local utility company is placing a complete dinner in the oven. Each article of food is shown to the audience before the demonstrator places it in the oven. After all dishes have been put in, the demonstrator sets the controls for time and temperature, and turns on the heat.

Meanwhile, the film has simultaneously explained each step in the process. There is no selling appeal. The film runs for about one and a half minutes, breaking off with the statement, "To be continued."

The regular matinee performance then begins. At its close, to the audience's great surprise—for nearly all persons have forgotten about the preliminary demonstration—the spotlight is again thrown on the range.

On the screen flashes Part 2 of "The Phantom Servant," explaining that while the audience was enjoying the program, a complete dinner was cooking in the oven. At this point the Home Service demonstrator opens the oven door and takes out the completely cooked meal. The film closes with a brief sales statement. Then the theater manager comes to the stage and draws a ticket from a box. The dinner is presented to the holder of the winning number.

The Wisconsin Public Service Corp. plans in the future to have a little girl place the food in the oven and turn on the controls, as further evidence of the simplicity of operation of a modern gas range.

■ ■

Ford Glass Plant to Reopen With Natural Gas

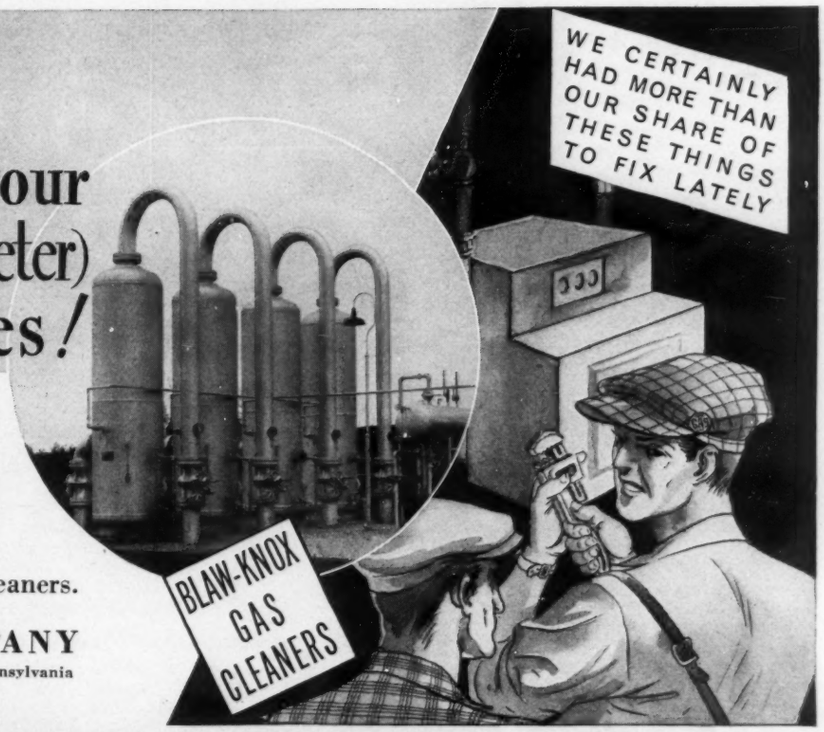
Natural gas will be used in the Ford Motor Co. glass manufacturing plant in Minneapolis, Minn., when it reopens after a five-year shut-down. The company has contracted for its supply with Northern Natural Gas Co., which already serves gas to the Ford assembly plant for boiler fuel. Some changes in piping are being made, and the plant is being modernized.

■ ■

Gas Exhibit Features Johns Hopkins Anniversary

A gas exhibit covering the fields of production, distribution, and utilization was displayed as part of the program commemorating the twenty-fifth anniversary of the Engineering School of The Johns Hopkins University, Baltimore, Md. The exhibit, representing the university's Department of Gas Engineering, was one of several shown during the three-day celebration.

Protect your "cash register" (meter) against losses!



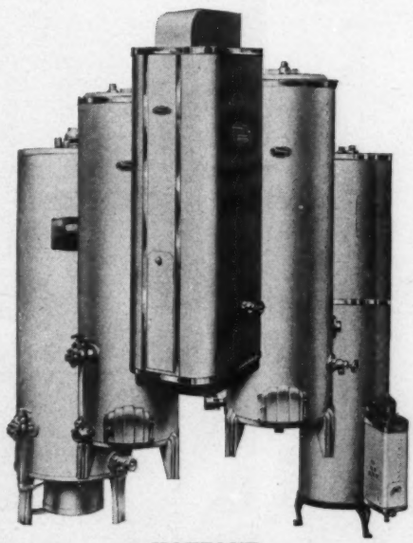
● Dirty gas makes meters slow. Protect your income by insuring continuous delivery of clean gas through the use of Blaw-Knox Gas Cleaners.

BLAW-KNOX COMPANY
2033 Farmer's Bank Bldg., Pittsburgh, Pennsylvania

BLAW-KNOX GAS CLEANERS

BLAW-KNOX

PYRAMID YOUR SALES



HOTZONE
Standard Line *Master Line*
Special Line *Stream Line*
Combination Line *Conversion Line*

HOTZONE
Welsbach

Self-Action Storage Gas Water Heaters

A TYPE AND SIZE TO FIT EVERY DOMESTIC REQUIREMENT

Write for Details of Our Complete Line.

Welsbach Company

Gloucester City, N. J.
BRANCHES IN CHICAGO AND SAN FRANCISCO
Since 1887 Pioneers in the Manufacture of Gas Burning Appliances

Bastian-Blessing Appoints Eastern District Manager

R. ADAM JOHNSTONE has joined The Bastian-Blessing Co. as eastern district manager. The appointment was effective on May 1.

R. A. JOHNSTONE

Mr. Johnstone is a graduate of the University of Missouri, where he majored in engineering subjects. Since his graduation, he has specialized in sales engineering work in the liquefied petroleum gas field in various sections of the United States.

Headquarters for Mr. Johnstone will be the offices of The Bastian-Blessing Co. in New York City. The Bastian-Blessing Co. is a pioneer in the manufacture of equipment for using and controlling high pressure gases.

■ ■

H. H. Cook Promoted to Sales Staff of N. G. E.

Harry H. Cook, for many years connected with the manufacturing division of Natural Gas Equipment, Inc., Los Angeles, Calif., has been appointed a field representative for the company. He has been assigned to the territory from Bakersfield south to the Los Angeles basin. His promotion recognizes, according to the company announcement, his thorough knowledge of N.G.E. products and their adaptation to the gas industry.

■ ■

Contract for 20-Mile Line Given by Oklahoma Natural

Oklahoma Natural Gas Co., Tulsa, Okla., has just awarded a contract to the White Deer Pipe Line Construction Co. for the construction of 20 miles of 10-inch and 18 miles of 8-inch line to run from Crescent to Enid, Okla. The line will be oxy-acetylene welded by the Lindeweld method. Work on the project is to begin at once.

■ ■

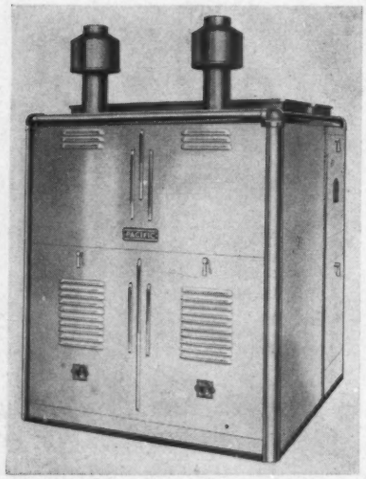
Porcelain Pointers in Booklet

"Selling Points for Household Appliances," a 24-page booklet containing aids for selling porcelain enameled products, has just been published by the Porcelain Enamel Institute. A feature of the booklet is the center spread which carries the caption, "This Matter of 'Chipping.'" Free copies may be obtained from the Porcelain Enamel Institute, 612 North Michigan Avenue, Chicago, Ill.

■ ■

Willett Succeeds Egolf

W. M. Willett, vice-president of Western United Gas & Electric Co., Aurora, Ill., has been elected a director of the company to fill the vacancy caused by the death of John F. Egolf.



Pacific Gas Radiator Puts New Furnace on Market

PACIFIC Gas Radiator Co., Los Angeles and Huntington Park, Calif., announces a new Pacific forced-air streamlined deluxe blower furnace. It is a completely coordinated winter-heating and air-conditioning unit, finished in a variety of colors to harmonize with its surroundings. Chrome trimming is used.

Pacific multi-tubular burners are standard equipment. There are no adjustable air-mixers. Each individual burner unit is a complete blue-flame burner, drawing its own individual air supply mixed to the exact proportion for complete combustion.

Pacific all-steel round heating element is used, designed to eliminate expansion and contraction, strains, and buckling noises.

This new Pacific furnace is especially recommended for the better homes; also for churches, offices, stores, etc., where clean, filtered air, delivered under positive pressure, is required — and where eye-appeal and quality are desired.

It is made in a range of sizes of heating capacities from 75,000 B.t.u. to 270,000 B.t.u. It is completely automatic in operation and is so constructed that summer cooling equipment may be added.

■ ■

Northern Illinois Utility Doubles Range Sales

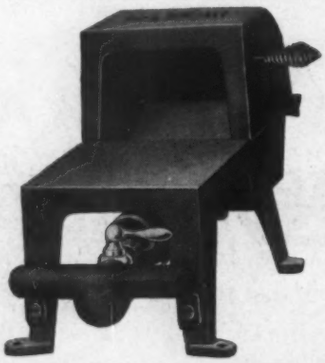
Public Service Co. of Northern Illinois approximately doubled its gas range sales from January 1 to April 6 this year as compared with the corresponding period in 1936. Gas ranges totaling 669 were sold up to April 6, 1937 and 337 were sold during the same time last year. A total of 573 automatic gas water heaters were sold this year as against 145 for last year and 75 gas refrigerators as against 31 for the period last year.

■ ■

Cabot Co. Starts Work On New Carbon Black Plant

Cabot Co., Pampa, Texas, has started construction of a new carbon black plant at Wicket, according to press dispatches. The plant will have a capacity of 20,000,000 cubic feet of gas daily and will be supplied from the North Ward County field by the Gulf Oil Corp.

JOHNSON NO. 501 Soldering Furnace



Economy plus practicability make this an outstanding furnace for general shop and factory use. Fired with one powerful Johnson Bunsen Burner, this furnace heats soldering coppers up to six lbs. per pair and can be used for heat-treating and metal melting. The Johnson Patented curved shaped hood forces a return blast over the tops of the irons or parts being heated. The base of the fire-box is lined with fire-brick. Write for free catalog.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Western Representative:
C. B. Babcock Co.
475 Eleventh Street
San Francisco, Calif.

Eastern Representative:
J. H. McPherson
250 Stuart Street
Boston, Mass.

BASO

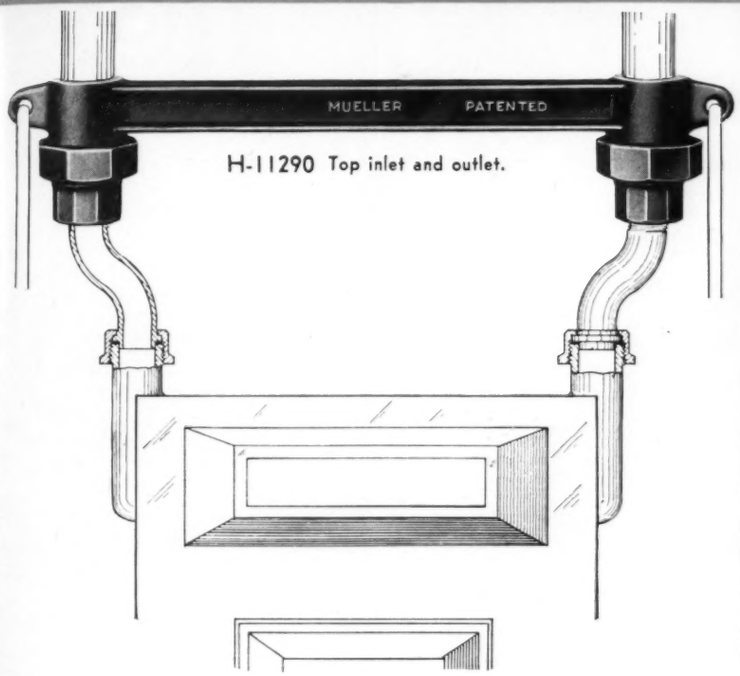
THERMO ELECTRIC SAFETY CONTROL FOR GAS BURNING APPLIANCES

BOILERS ★ FURNACES ★ CONV. BURNERS ★ SPACE HEATERS ★ UNIT HEATERS ★ AIR CONDITIONERS OVENS ★ RANGES ★ WATER HEATERS, ETC.

GAS VALVE SERIES 500

ELECTRIC SWITCH SERIES 600

MILWAUKEE GAS SPECIALTY CO.
MILWAUKEE ★ WISCONSIN



H-11290 Top inlet and outlet.

METER SAFETY

AND METER PROTECTION DEPEND ON

rigid installation

H-11280
End inlet—Top outlet.

H-11285
Elbow inlet—Top outlet.

H-11287
U-type inlet—Top outlet.

H-11295
End inlet with lock-wing stop—Top outlet.

H-11300
Top inlet with lock-wing stop—Top outlet.

1. Threads protected from rust and side strain.
2. Pipes braced and aligned.
3. Bevel centers and aligns connector.
4. Only two connections—no union joints or gaskets.
5. Strong malleable nut.
6. Accurate threading and dimensions.

H-11160 H-11162 H-11164

Mueller Meter Swivels are made in both malleable iron and brass. The offsets are evenly curved assuring full pipe opening from end to end. Shoulders and threaded ends are in accurate alignment. Typical malleable swivels are shown above.

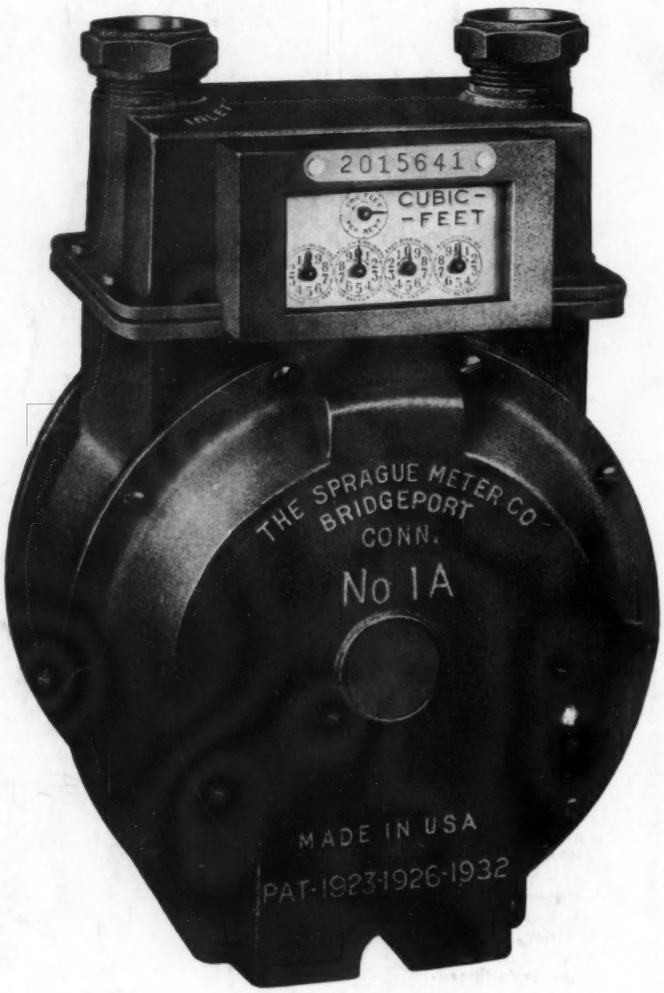
Mueller's new achievement in meter protection is the bevel centering connector. The bevel face on the bar is pulled together with the bevel connector at the pipe by a malleable nut. This forms a rigid connection of accurate registration and alignment. This construction will withstand the strain of shifting or settling pipes because the threaded part, which is the weakest section of the pipe, is braced by the walls of the meter bar.

Assure reduced meter repair—install Mueller Rigid Meter Bar Connections.

MUELLER CO.
Decatur, Illinois

MUELLER

RIGID BAR METER CONNECTIONS



SPRAGUE METERS

REDUCE OPERATING COSTS

THE SPRAGUE METER COMPANY

LOS ANGELES + + SAN FRANCISCO

BRIDGEPORT, CONN.